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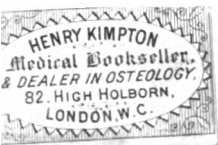
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Yearbook of pharmacy

Pharmaceutical Society of Great Britain



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This Association of Chemists and Druggists and others interested in Pharmacy is managed by about twenty unpaid officers annually elected by the members.

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Gentlemen desiring to join the Conference can be nominated at any time on applying to a Secretary or any other Officer or member. The Name and Address of each candidate should be written legibly, and forwarded to "The Secretary," British Pharmaceutical Conference, 17, Bloomsbury Square, London, W.C., together with the subscription.

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WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL
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AT THE

TWENTY-FIRST ANNUAL MEETING

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THE BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH, AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1885 will be held at Aberdeen, on Tuesday and Wednesday, September 8th and 9th.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretary, or any other officer or member. The yearly subscription is payable in advance, on July 1st. The amount, which includes free delivery of the Year-Book, is 7s. 6d. for members residing in any European country, Canada, or the United States of America. For those resident in other countries, if the Year-Book be mailed direct to members, it is as follows:—Australasian Colonies, 10s.; South Africa, India, China, and Japan, 9s. 6d.; West Indies, 8s. 10d. Further information may be obtained from

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THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of 500 to 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 357.

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INTRODUCTION.

FOLLOWING the custom of former years, we preface this volume with a brief sketch of its leading contents, and again select for a starting point the latest contributions to the chemistry of the alkaloids, as probably the subject of greatest and most universal interest to the readers of pharmaceutical literature. It will be remembered from the researches of Dr. E. Fischer on caffeine, theobromine, and xanthine, that each of these bases can be artificially prepared from guanine, by converting the latter into xanthine, this into theobromine, and this again, by Strecker's method, into caffeine. A careful comparison, recently made by Dr. E. Schmidt, confirms the perfect identity of caffeine thus obtained with the natural product. A study, by the same chemist, of the action of hydrochloric acid on caffeine and theobromine, together with corresponding investigations on the action of alkalies, by MM. Maly and Andreasch, throws some additional light on the constitution of these two bodies. Dr. Schmidt has also established the occurrence of caffeine in cocoa, while Prof. Schorlemmer records the presence of the same alkaloid in the leaves of tea and coffee grown at Kew Gardens. In the opinion of the latter, the manufacture of caffeine for medicinal purposes from Peruvian guano may be looked for as a probable and early consequence of Dr. Fischer's important discoveries. The salts of caffeine form the subject of a further report by Dr. H. Biedermann; and his results, taken in conjunction with those obtained some time ago by Mr. J. U. Lloyd (*Year-Book of Pharmacy*, 1881, p. 38), may be accepted as a final settlement of the often disputed existence of these salts as definite chemical combinations. A number of well-defined salts and derivatives of theobromine are described by Drs. E. Schmidt and H. Pressler.

In a note on cinchona alkaloids, Messrs. C. H. Wood and E. L. Barrett refer to their previous statement respecting the crystals

obtained from an ethereal extract of cuprea bark, and report as the result of a further examination that these crystals contain equal proportions of quinine and quinidine in combination with water. M. Mazzara describes a peculiar compound of quinine and chloral, corresponding to the formula $C_{20}H_{24}N_2O_2, CCl_3.CO H$, and obtained by treating a chloroform solution of quinine with an equivalent proportion of anhydrous chloral. This body is partially decomposed by water and completely by acids. A chloral compound of quinoline has been obtained by Mr. O. Rhoussopoulos in a crystalline form by mixing ethereal solutions of the two components. M. Arnaud publishes a process for the extraction of cinchonamine from the bark of *Remijia purdiana*, as well as a description of the properties of this base and of some of its salts. Kerner's cinchocerotin has been re-examined by Mr. A. Helms, who finds it to be a mixture of a white crystallizable body and a small proportion of a light yellow substance. For the former of these he retains the name of *cinchocerotin*, and assigns to it the formula $O_{37}H_{48}O_2$. A paper on kairine and kairolin, by M. Filehne, supplies some further information respecting the physiological properties of these interesting synthetically prepared bases.

Prof. Ladenburg shows that piperidine may be artificially prepared from pyridine by the action of sodium on an alcoholic solution of the latter, but that this change is far from complete. The two bases may be separated by nitrous acid, the resulting nitrosopiperidine being afterwards decomposed by hydrochloric acid. The platinochloride prepared from the resulting alkaloid shows a complete agreement in properties with the corresponding platinum salt of ordinary piperidine. Mr. J. Mensel claims to have effected the synthesis of nicotine by the following process:—Benzoic acid is dissolved in acetone, and the whole mixed with concentrated sulphuric acid. A precipitate is thereby formed, which on heating redissolves in an excess of acetone. When cool, a solution of ammonia gas in absolute alcohol is added, whereupon ammonium sulphate is precipitated, and nicotine is found with other products of decomposition and undecomposed acetone in the supernatant liquid.

The behaviour of morphine and some of its derivatives towards anhydrides of the fatty acids has been investigated by Dr. O. Hesse, with results leading to the conclusion that this alkaloid contains only two atoms of hydrogen capable of being substituted by radicals of the fatty series. Further studies concerning the action of oxidizing agents on the same alkaloid lead Messrs. L. Barth and H.

Weidel to infer that the absence of aromatic compounds among the products formed in the treatment of morphine with permanganate, and the non-occurrence of derivatives of pyridine or quinoline in the oxidation of this base with caustic alkalies, tend to show that the mode of combination of the aromatic and of the pyridine- (or quinoline-) groups in this alkaloid is different from that existing in narcotine, which can be so readily resolved into its two principal constituents. The salts of narcotine and codeine have received the attention of Mr. D. B. Dott, who furnishes descriptions of the meconate, acetate, hydrochloride, and sulphate of the former, and of the hydrobromide of the latter base.

In the latest addition to his well-known series of reports on the mydriatic alkaloids, Prof. Ladenburg, in conjunction with Dr. C. F. Roth, deals with the alkaloids hyoscyne and belladonine, and in connection with the former chiefly with the physical and chemical properties of its chief decomposition-product, pseudotropine. Among the products of resolution of belladonine, tropine, an oxytropine and tropic acid are mentioned.

The composition of the alkaloid berberine has at different times been represented by contradictory formulæ; and for this reason Dr. E. Schmidt has induced Mr. J. Court to re-investigate this subject. Numerous analyses made by the latter of the free base, the hydrochlorate, nitrate, and sulphate, lead to the formula $C_{20}H_{17}NO_4 + 4H_2O$, which, with the exception of the water of crystallization, agrees with that found by Messrs. Perrin and Hlasiwetz. Mr. O. Bernheimer records the observation that berberine, when distilled with a considerable excess of potassium hydrate, yields quinoline besides the two acids described by Hlasiwetz.

The alkaloids lycoctonine and acolyctine, isolated many years ago by Dr. Hübschmann from the roots of the yellow-flowered *Aconitum Lycoctonum*, have recently received the attention of MM. Dragendorff and Spohn, who come to the conclusion that these two bodies are decomposition products, though not of aconitine and pseudaconitine, as stated some time ago by Messrs. Wright and Luff, but of two hitherto unnoticed alkaloids peculiar to *A. Lycoctonum*, which they propose to name *lycaconitine* and *myoctonine*, and represent by the formulæ $C_{27}H_{34}N_2O_8$, and $C_{27}H_{30}N_2O_8$. Physiological experiments appear to indicate that lycaconitine is an energetic poison, resembling curare in its action.

Mr. Naylor furnishes some additional information respecting hymenodictyonine, the alkaloid isolated by him from *Hymenodictyon excelsum*, which he has now obtained in a crystalline form

and shown to have a composition corresponding to the formula $C_{23}H_{40}N_2$. The results of his experiments lead to the inference that this body is a tertiary diamine closely allied to nicotine, with which it is probably homologous.

Messrs. G. Koerner and C. Boehringer give a description of the alkaloids cusparine and gallipeine which, in addition to another base and some aromatic substances, they have obtained from angustura bark. These bases are characterized by the ease with which, under various influences, they may be transformed into other alkaloids, with simultaneous formation of acids.

Among recent contributions to the literature of strychnine, one by M. Crespi, and another by MM. Hanriot and Blarez, are devoted to the relative solubility of this alkaloid and its salts in various solvents. The results of the two last named authors show that though strychnine is soluble in very dilute acids, its solubility is markedly lessened when the acids are used in a little less diluted condition; and that this is specially the case when the acid employed is the same as that contained in the salt of strychnine experimented with. Concentrated solutions of strychnine salts, when slightly acidified, form precipitates which are soluble in an excess of acid, and are reprecipitated from this solution upon dilution with water. Prof. Plugge discusses the question whether or not strychnine passes unchanged through the animal organism, and quotes experiments showing that the alkaloid is decomposed in the system, but not in such a manner as to prevent its detection, since the main product of its decomposition shares the well known reaction of the alkaloid with sulphuric acid and potassium bichromate, though it differs from the base in many other respects.

The chemistry of nux vomica forms the subject of a portion of an elaborate report presented to the last meeting of the British Pharmaceutical Conference by Messrs. W. R. Dunstan and F. W. Short. The main feature in the process employed by these chemists for the estimation of the total alkaloids in the seeds consists in their extraction by means of a mixture of chloroform and alcohol, while the separation of brucine from strychnine is effected by a method based upon the different solubility of their ferrocyanides. The analytical results quoted by them exhibit a very considerable variation in the alkaloidal value of nux vomica obtained from different sources. The same paper also contains an account of a new glucoside, *loganin*, isolated from the pulp of the fruit, and likewise found to occur in small quantities in the seeds and the pharmaceutical preparations made from them.

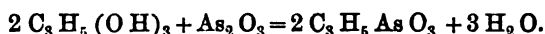
A number of able investigators have again given their attention to the "ptomaines," or alkaloids produced by putrefaction, a class of bodies full of interest to the physiologist as well as the chemist, and possessing special importance to those likely to be engaged in forensic analyses. No fewer than ten reports dealing with this subject will be found in the present volume. We may call attention here to one of these bodies reported upon by Prof. Giacomelli, presenting a close resemblance to picrotoxin in its physical appearance and chemical reactions. Some time ago the detection of a similar body in beer gave rise at first to the suspicion that *cocculus indicus* had been used; but afterwards its origin was attributed to alteration of albuminoid substances normally present in the liquor. Dr. A. Poehl throws additional light on the cause of epidemics known to have been brought about by unsound bread and flour, and especially observed after long continued rains and floods, which develop an abundance of *Claviceps purpurea* in the following harvests. It has long been known that ergotized flour may produce toxic effects far in excess of those attributable to the poisonous properties of the proportion of ergot contained in it, and the explanation of this is now found in the fact that the fungus favours the decomposition and putrefaction of the albumens, thus giving rise to the formation of poisonous ptomaines.

Mr. J. Habermann publishes the results of experiments on the composition of arbutin and its behaviour at high temperatures, tending to establish the correctness of the formula, $C_{25}H_{34}O_{14}$, and to disprove the existence of two different natural arbutins asserted by MM. Schiff and Michael (*Year-Book of Pharmacy*, 1883, p. 124). MM. Adrian and Moreaux offer unfavourable criticism on the various published methods for the extraction of quassiin, the active principle of *Quassia amara*, on the ground that some of the processes give but a defective product, while the others, though yielding purer quassiin, extract but a small portion of the bitter principle from the wood. They also give a detailed description of a new process, by which a purer and more abundant product is obtained. The root of *Myrtus Jambosa* has yielded to Mr. A. W. Gerrard a crystalline principle answering to the formula $C_{10}H_{15}NO_3$, for which he proposes the name *jambosin*. M. Schiaparelli draws attention to the great want of accordance in the published analyses of saponin, and to the doubt still existing as to the nature and identity of the products extracted from different plants, and included under this name. In order to throw further light on these questions, he has undertaken an investigation in which he is still en-

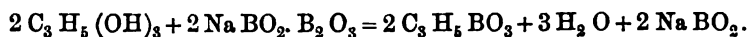
gaged. The saponin from *Saponaria officinalis* is found by him to have a composition corresponding to the formula $C_{32}H_{44}O_{18}$, and to be the least optically active of all known glucosides.

An improved process for the preparation of sclerotic acid, the active principle of ergot, is described by Dr. Podwissotzky, who first discovered this substance in conjunction with Professor Dragendorff. For hypodermic use it is suggested that this preparation should be employed in the form of a solution in thymol water, containing one part per thousand, which keeps fairly well and possesses the advantage over the various ergotines of not producing irritation or inflammation of the connective tissue. Among other organic acids discussed in the pages of this volume may be named opianic, chrysophanic, cinnamic, quinovic, chelidonic, arabic, tartaric, lactic, and glycollic acids, and a new acid extracted from beet juice.

The solvent action of glycerin on arsenious anhydride has long been known, though its cause does not appear to have been hitherto understood. It now receives some elucidation from experiments by Mr. H. Jackson, proving that the two substances react together to form normal glyceryl arsenite, or the arsenious ether of glycerin, as represented by the following equation,—



This compound is described as a colourless, transparent, vitreous, and very deliquescent solid, which is decomposed by water into glycerin and arsenious acid, and is very freely soluble in glycerin and in absolute alcohol. Mr. W. R. Dunstan has examined the action of glycerin and other polyhydric alcohols upon borax, with the result of showing that these alcohols decompose sodium pyroborate with the formation of sodium metaborate and a boric ether, or, if water be present, of free boric acid in place of the ether. In the case of glycerin, all the three hydroxyl groups are substituted by the boric radical in accordance with the following equation,—



But since water is one of the products formed, this reaction is never complete except at high temperatures, owing to the decomposition of glyceryl borate into glycerin and free boric acid. In aqueous solutions, therefore, the final products of the reaction are sodium metaborate, free boric acid, and glycerin, a change which explains the well-known power of glycerin to impart an acid reaction to solutions of borax. Researches by Messrs. A. Lieben

and S. Zeisel on the constitution of butyl chloral lead to the inference that this substance ought to be represented by the formula $\text{C}_2\text{H}_5 \cdot \text{CHCl} \cdot \text{CCl}_2 \cdot \text{CHO}$.

The transformation of starch by dilute mineral acids is generally regarded as a splitting up of its molecules into dextrin and dextrose; but in the light of recent experiments by Mr. F. Salomon, the actual change taking place is not exactly represented by this view. His results seem to show that the complex starch molecule is first converted into the more simple soluble starch, and next into dextrin, the latter change being then immediately followed or accompanied by the hydrolysis of the dextrin into dextrose. The rate of the conversion is said to be proportional to the amount of sulphuric acid present. The action of organic acids is much less vigorous, but the course of the transformation seems to be the same. The various substances extracted from starch and described under the names of granulose, amidulin, and amylopectin, have been re-examined by Mr. B. Bruckner, who arrives at the conclusion that these bodies, together with starch paste and soluble starch, though differing in their physical properties, must be considered as identical from a chemical point of view. The other carbohydrates of which notices occur in this volume include saccharin, maltose, lactose, and mannite.

Messrs. H. E. Armstrong and A. K. Miller, in a contribution to the chemistry of camphor, have studied the action of zinc chloride on this substance, and find, contrary to the results of previous investigators, that cymene is not one of the products of this action. The main products obtained by them are camphorone, $\text{C}_9\text{H}_{14}\text{O}$, carvacrol, a saturated hydrocarbon of the formula $\text{C}_{10}\text{H}_{20}$, and a mixture of benzene hydrocarbons of the formula $\text{C}_{10}\text{H}_{14}$, among which ordinary cymene is not present. The chief products of the action of iodine on camphor are found to be carvacrol, and the saturated hydrocarbon $\text{C}_{10}\text{H}_{20}$; but here too cymene is absent. In the action of phosphoric anhydride or of phosphoric pentasulphide on camphor, however, cymene appears to be a constant and principal constituent of the products obtained. The process of converting camphor into borneol by treating its alcoholic solution with sodium, recommended by MM. Jackson and Menke, as a suitable mode of preparing borneol, is unfavourably criticised by Messrs. J. Kachler and F. V. Spitzer, on the ground that the yield is much smaller than had been stated by those chemists, and that the separation of the borneol from the undecomposed camphor is impracticable. Dr. A. Beyer confirms Dr. Gladstone's observation respecting the

identity of the carvol from dill oil with that obtained from oil of caraway; and also a statement by Professor Flückiger to the effect that carvol from mint oil differs from that of the two other oils named in being lævorotatory, though he finds it to agree with the others in its chemical and other physical properties. The carvacrol obtained from this lævorotatory carvol by the action of metaphosphoric acid proves to be perfectly identical in all respects with that prepared by the same process from the dextrorotatory carvols of dill and caraway oils.

Mr. W. T. Wenzell calls attention to the methods which have been recommended for the preparation of phosphoric acid by the oxidation of phosphorus with air in presence of moisture, and dwells upon the conditions most favourable to the successful working of this process. An improved mode of preparing hydrobromic acid, suggested by Mr. W. Grüning, consists in the distillation of a mixture of potassium or sodium bromide and phosphoric acid of 1.30 specific gravity. Mr. E. Bensemann shows that hydrochloric acid may be readily and entirely freed from arsenic by diluting it with water, adding a small quantity of potassium chlorate, and then distilling at a moderate heat. The constitution of chlorinated lime, which has so often taxed the ingenuity of critical investigators, forms the subject of a new research by Messrs. G. Lunge and P. Naef, the results of which tend to confirm once more the correctness of the formula Ca Cl. Cl O , first proposed by Odling, and to dispose of the objections recently brought forward against this view by M. Krant.

Dealing with the preparation of bismuth salts, Mr. L. Wolff points out that the processes which have been suggested from time to time for the preparation of the salicylate of this metal, all suffer from the defect of yielding mixtures of subnitrate and salicylate. The plan recommended by him as giving a satisfactory product consists in the addition of a concentrated solution of sodium salicylate to a glycerin solution of crystallized bismuth nitrate, and washing the precipitate thus formed, first with cold, then with hot water, and finally with alcohol, in order to free it from salicylic acid. An account of the detection of all likely impurities in the officinal subnitrate of bismuth is published by Dr. H. Hager, and may prove useful as a supplement to the directions given in the Pharmacopœia for the testing of this important remedy. A paper by Dr. C. Hoffmann deals with the pentoxide of bismuth, $\text{Bi}_2 \text{O}_5$, also known as bismuthic acid, and the mode of obtaining its alkaline combinations.

Prof. Stolba recommends a new process for entirely freeing commercial zinc from arsenic, the main features of which consist in the exposure of the metal to the simultaneous action of steam and sulphur vapour in such a manner that these agents rise from the bottom of the crucible through the molten metal. Full directions are given by him as to the manner in which this may be accomplished. The possibility of sulphuretted hydrogen being contaminated with arsenic emanating from the impure materials employed in its generation, and the serious risk of error likely to arise from the use of a gas thus contaminated in forensic investigations, have been repeatedly pointed out, notably so by Drs. J. and R. Otto (*Year-Book of Pharmacy*, 1880, p. 120). This subject is now again brought under the notice of the profession by Mr. W. Lenz, who describes a process for the purification of the gas. We would suggest a thorough re-examination of this matter, believing as we do from our own experience that all risk of this contamination may be avoided by the very simple plan of employing dilute sulphuric acid sufficiently weak to produce a slow current of the gas at a low temperature, and washing the gas in the usual way by passing it through pure water. As another source of error in forensic analyses of this kind, Dr. W. Fresenius directs attention to the now very general occurrence of arsenic in almost all kinds of glass used for chemical apparatus. Acids do not extract any arsenic from such glass, but alkaline liquids are liable to do so. The risk of error is shown to be greatest if the glass of the reduction tube in Fresenius and Babo's apparatus contains arsenic, and especially if this mode of reduction be conducted at a very high temperature; but it may be altogether avoided by placing the mixture to be heated in a porcelain boat, and thus preventing it from coming into direct contact with the glass. No error from this source need be apprehended in Marsh's test, as any liberation of arsenic from the glass of the apparatus would here be detected before the introduction of the suspected substance.

The past year's literature of analytical chemistry has been unusually productive in new or improved methods, and a brief sketch of some of the work done in this direction may not be out of place in this introductory chapter. Mr. W. L. McCay describes a new volumetric process for the estimation of arsenic by means of standard solution of silver nitrate. The arsenic is first converted into arsenic acid or sodium arsenate, the solution of which in boiling water is mixed with an excess of the silver solution, and then, after well stirring and allowing to cool, with dilute ammonia, drop

by drop, until the precipitation is complete. The silver arsenate is now collected on a filter and washed, the filtrate together with the washings mixed with a few drops of ferric sulphate solution, and the excess of silver then titrated with ammonium sulphocyanide according to Volhard's method (See *Year-Book of Pharmacy*, 1874, p. 253). New modes of titrating mercury are suggested by Mr. G. Kroupa and Mr. A. Haswell. In one of these the mercury is precipitated as mercurous chloride, the latter decomposed with sulphuretted hydrogen, the excess of this gas removed by zinc acetate after neutralising the liberated hydrochloric acid with an excess of barium carbonate, and the quantity of chloride in the solution now determined by titration with silver nitrate in the usual manner. From this amount the proportion of mercury is deduced from calculation. In the other process a measured quantity of the mercuric chloride solution is mixed with a known excess of ferrous sulphate and supersaturated with pure potash; the blackish brown precipitate thus formed is treated with sulphuric acid until it is converted into perfectly white mercurous chloride, and the excess of ferrous iron then estimated by titration with permanganate. A new test for tin proposed by Mr. C. B. Dryer, consists in the reverse application of the well-known delicate reaction between stannous chloride and a nitric acid solution of brucine. A solution of cochineal is recommended by Mr. A. W. Blyth as a delicate test for lead in neutral or alkaline solutions with which it strikes a deep mauve colour. Copper and bismuth may be separated, as shown by Mr. J. Loewe, by taking advantage of the different behaviour of the cold glycerin solutions of their precipitated hydrates towards glucose. For the titration of zinc by means of sodium sulphide, thallium paper is recommended by M. Schroeder as an indicator in the place of lead or cobalt paper. The complete precipitation of zinc by sulphuretted hydrogen from very dilute solutions containing but a very minute proportion of free sulphuric acid serves as the basis of a process for the estimation of this metal and its separation from manganese, iron, nickel, and cobalt, suggested by Mr. L. Schneider. Messrs. Krutwig and Cochetoux confirm Zimmermann's observation respecting the value of manganese sulphate for counteracting the injurious influence of hydrochloric acid in the titration of iron by means of permanganate. The estimation of the same metal by potassium bichromate is found by Dr. E. B. Schmidt to suffer in accuracy through the application of zinc as a reducing agent. The well known delicacy of the reaction between hæmatoxylin and such metals as lead, copper, and iron is shown by Mr. A. W. Weddell

to afford a ready means for the detection of metallic impurities in potable water. M. Guyard, availing himself of hæmatoxylin as an indicator in alkalimetry, proposes to employ boric acid in the place of sulphuric acid as a standard readily procured in a state of purity, and by which it is easy to prepare a strictly normal sulphuric acid. With this indicator the difference between strong and weak acids disappears, boric acid producing as decided a change of colour as sulphuric. The relative value of litmus, rosolic acid, methyl orange, phenacetolin, and phenolphthalein in the titration of the alkalies and alkaline earths, and their acid and basic salts, has been studied by Mr. R. T. Thomson, who gives a tabulated summary of his results.

The analysis of mixtures of chlorides, bromides, and iodides forms the subject of a number of researches which cannot fail to be interesting to the readers of this volume; but space does not permit us to deal with so large a subject in this place. M. Longi points out that the usual mode of separating hydrocyanic acid in forensic investigations, by distillation with tartaric acid, does not afford a satisfactory distinction between poisonous cyanides and harmless ferrocyanides and similar compounds, and pleads in favour of Jacquemin's or Barfoed's process for liberating the hydrocyanic acid. A new and very delicate test for sulphuretted hydrogen, suggested by Dr. E. Fischer, is based on the formation of methylene blue. New methods for the estimation of nitric and nitrous acids will also be found in this volume. A critical examination of the various modes of employing permanganate for the estimation of nitrogenous matter in potable water induces Mr. A. R. Leeds to declare in favour of the operation being conducted at a boiling heat and in the presence of sulphuric acid, according to the Kübel-Tiemann method.

Mr. S. Young shows that potassium cyanide may be used as a delicate and distinctive test for gallic acid, which has the advantage of not being affected by the presence of tannin. The reaction between potassium cyanide and picric acid serves as the basis of a colorimetric process suggested by Mr. G. Christel for the estimation of the latter. The determination of phenol in creasote oils by Koppeschaar's method is shown by Dr. Kleinert to be liable to give very fallacious results. Prof. J. F. Eykmann describes a new colour reaction for thymol, by means of which this substance may be recognised and distinguished from phenol, as well as from menthol, camphol, and borneol.

The well-known ferrocyanide test for quinine has been experi-

mented with by Dr. A. Vogel with the result of demonstrating that bromine water is better suited for this reaction than chlorine water, and that the ammonium carbonate usually added after the ferrocyanide, may be advantageously replaced by sodium phosphate or borax. Dr. Geissler reports unfavourably on the official test of the German Pharmacopœia for estimating the percentage of morphine in opium, pointing out that the separation of the alkaloid is incomplete, and that the results are not uniform. A research on morphine by Mr. E. Scheibe deals with the separation of this alkaloid in forensic investigations. A study of the behaviour of atropine towards mercuric chloride, by Mr. A. W. Gerrard, has led to the discovery of a new reaction and test for this base. Vanadium sulphate and ammonium vanadate have been used by Mr. K. F. Mandelin with success as reagents for alkaloids, and especially for the detection of strychnine.

Mr. C. O'Sullivan has devised a practical and exact method for the estimation of starch in cereals, consisting in the successive washing of the ground grain with ether, rectified spirit, and warm water, the gelatinization of the washed residue with boiling water, the subsequent conversion of the starch by means of diastase into dextrin and maltose, and the estimation of these two products. Mr. L. Reed publishes a colorimetric process for the determination of gluten in flour, which is based on the production of a yellow nitro-compound by the action of nitric acid on albuminoids. Processes for the analysis of wine, milk, fats, oils, and a number of technical products will also be found among the analytical methods described in this volume.

The contributions to physiological chemistry occupying a place in this work will be found to comprise abstracts of articles on urea, uric acid, tyrosine, paraxanthine, creatinine, albuminoids, peptone and peptic digestion.

Of the remedies introduced or proposed during the year, the majority have already met with previous notices. The Indian drug known by the name of Gulancha, consisting of the roots and stems of *Tinospora cordifolia*, is now re-introduced to the notice of the profession as a tonic, antiperiodic, and diuretic. *Geum album* is recommended by Dr. W. A. Spurgeon as a valuable anti-emetic, relieving gastric irritation and headache. *Tradescantia erecta*, a Mexican plant now cultivated at Versailles, is reported to possess very valuable styptic properties. *Pallilo*, another Mexican remedy, is referred to *Croton morifolius*. Its leaves are used in the form of a tincture as a stomachic and for the relief of neuralgia, while the

fatty oil expressed from its seeds is stated to possess strong purgative properties. Dr. Campardon reports very favourably on the action of the leaves of *Lythrum Salicaria*, in acute and chronic inflammation of the gastro-intestinal mucous membrane, and attributes its effects to the tannin and mucilage contained in it. The reputed value of *Convallaria majalis* as a substitute for digitalis in cardiac affections receives further confirmation from a number of trials by Dr. W. S. Gottheil, who also states in its favour that it does not produce cumulative effects. The fruit of *Sizygium Jambolanum*, an East Indian plant belonging to the order *Myrtaceæ*, is coming into favour as a remedy for diabetes. Hazigne, a Malagasy plant enjoying considerable reputation among the natives as a remedy for skin diseases, is referred by M. Baillon to *Symphonia fasciculata*, belonging to the order *Guttifera*. The parts used are the oil obtained from the fruit and a resin exuding from the stem. An examination made by Prof. Thiselton Dyer, of authentic fruit-bearing specimens of the waras-yielding plant, affords definite proof of it being really that described by J. B. Baker, in the "Flora of Tropical Africa," as *Flemingia rhodocarpa*, which, according to Prof. Oliver is identical with *Flemingia Grahamiana*, growing in Southern India. The bark known as "China bicolorata" or "Tecamez bark" is attributed by Mr. Hodgkin to a species of *Remijia*, which he names *R. bicolorata*.

The great variation in quality and activity of commercial specimens of aconite root has induced Dr. E. R. Squibb to suggest a simple test which may be readily applied to any suspected piece. A very thin slice, weighing about a centigram, cut across from the middle of the root, is approximately divided into ten equal parts, representing about a milligram each. One of such pieces, taken between the front teeth and chewed in contact with the tip of the tongue, with saliva enough to wet it, for about one minute, should give the aconite impression, not strongly, and not amounting to tingling, but yet a distinct impression, which, when experienced a few times, will always be recognised. A report on English rhubarbs, presented by Mr. W. Elborne to the British Pharmaceutical Conference, shows among many other points of interest, that this drug as now met with in commerce consists no longer exclusively of the roots of *Rheum raphonticum*, but contains a fair proportion of those of *R. officinale*. Mr. A. W. Gerrard has concluded his researches on the alkaloidal value of wild and cultivated belladonna, and reports that though the wild plant is in general slightly richer in alkaloid than the cultivated, the latter appears to him preferable for pharmaceuti-

cal preparations, on account of its greater uniformity. He finds the largest proportion of alkaloid in the leaf, and the next largest in the root, while fruit and stem follow in order after these. His suggestion that the leaf should therefore supersede the root in medicine is not regarded with the same favour by Professor Redwood, who considers the leaves more liable to deterioration than the root. For the assay of belladonna root, Messrs. W. R. Dunstan and F. Ransom recommend a new process, in which a mixture of equal volumes of chloroform and absolute alcohol is used as the menstruum for exhaustion.

In an interesting paper on the pharmacy of linseed, Mr. T. Greenish expresses his strong objection to the use of linseed cake as a source of the official meal, and pleads in favour of linseed rich in farina and free from weed seeds, crushed lightly between iron rollers without expressing any oil, and with about 20 per cent. of the husk removed, to make it approximate more closely to a meal. His reasons for this recommendation will be found fully explained in his paper.

Chemical research has again been extended to a considerable number of vegetable drugs. Dr. O. Schmiedeberg has isolated two active principles from the root of *Apocynum cannabinum*, which he proposes to name *apocynin* and *apocynein*. Andromedotoxin, the poisonous principle isolated some time ago by Prof. Plugge from *Andromeda Japonica*, is now shown by him to occur also in *Andromeda polifolia*, which grows wild in some parts of Germany. *Artemisia Abrotanum* has yielded to M. Craveri a crystallizable alkaloid, named by him *abrotine*, possessing antipyretic and antiseptic properties. *Boldoa fragrans* is found by M. Chapoteaut to contain a glucoside of the formula $C_{39}H_{52}O_8$, besides the feebly alkaline principle termed *boldine*. Alkaloidal principles have also been isolated from the stem and root of *Franciscea uniflora*, an American drug known as manaca, or vegetable mercury, and from Jambu Assu, a Brazilian drug of unascertained botanical origin. M. Naudin has obtained two crystallizable bodies from chamomile flowers, one of which has been examined by him and named *anthemen*. Prof. Attfield shows that sugar is a normal constituent of tobacco, occurring in it in proportions varying from mere traces up to ten per cent. A portion of this appears to be a kind of saccharine matter peculiar to tobacco, and this he distinguishes by the name "tobacco-sugar." In a paper on *Alpina officinarum*, communicated to the British Pharmaceutical Conference, Dr. Thresh announces the isolation from the rhizome of this plant of an active pungent principle, which

he has named *galangol*; while in another communication read at the same meeting, he deals with certain points of resemblance between this body and the pungent principles ginger, capsicum, and grains of paradise. Dr. H. Senier has continued his researches on croton oil, and now reports that the purgative properties of this oil reside entirely in the portion insoluble in alcohol, and that this portion is likely to become a valuable medicinal agent, especially as it is quite free from vesicating effects. It will be remembered from his previous results that the vesicating principle of the oil is confined to the portion soluble in alcohol.

In order to prevent an undue extension of this introductory chapter, we must refrain from noticing or even enumerating a great number of other drugs not yet alluded to, which have also formed subjects of chemical, microscopical, or pharmaceutical research, and have found a place in this volume.

The past year's literature of drug adulteration and the method of its detection will be found to comprise reports on saffron, conium, chiretta, Peruvian balsam, copaiba, almond oil, olive oil, beeswax, oil of chamomile, and essential oils in general.

Prof. Redwood publishes the details of an improved process of preparing liquid extract of cinchona bark, having for its object the production of a preparation of definite and uniform alkaloidal strength, coupled with a practically complete exhaustion of the bark. He uses the bark of *Cinchona succirubra*, and employs water acidified with hydrochloric acid, as the menstruum for extraction. The process includes an estimation of the total alkaloids, and is otherwise so conducted that the final product will form a clear mixture when diluted with water. With reference to this process, Mr. J. Cownley states that in his hands it has failed to effect a perfectly complete extraction of the alkaloids from the bark, and that he finds the relative proportions of the individual alkaloids somewhat different from those contained in the bark operated upon. Directions for the preparation of extract and tincture of nux-vomica of definite alkaloidal strength, and containing the whole of the alkaloids of the seeds employed in the process, are given by Messrs. Dunstan and Short, and are based on the results of their researches on the chemistry of this drug. In the case of these two preparations, and that of Prof. Redwood's extract of cinchona just alluded to, pharmacists will thus find themselves brought face to face with a new departure aiming at the standardizing of such preparations as tinctures and extracts containing powerful alkaloids; and we cannot but agree with the words of caution, uttered by Messrs.

G. F. Schacht and D. B. Dott, against travelling too fast in this direction without a more perfect knowledge of the resulting advantages or disadvantages.

The very unsatisfactory nature of such preparations as "*Pilula Hydrargyri*," "*Hydrargyrum cum Creta*," and "*Unguentum Hydrargyri*," is forcibly brought to light by Messrs. Maben and Dechan in their communication on this subject to the British Pharmaceutical Conference; but it is difficult to see how anything like permanency in these preparations can be attained.

The observations made by Mr. J. Williams on the products obtained during the preparation of specimens of colourless and anhydrous essential oils, afford valuable indications of the direction in which improvements in the distillation of such oils may be effected in order to obtain products of the finest quality.

We conclude this chapter by inviting the reader's attention to the interesting reports on *spiritus ætheris nitrosi*, by Messrs. W. H. Symons, P. McEwan, and D. B. Dott; on the purification of lard by Prof. Redwood and Mr. W. Willmott; and on the use of *petrolatum* in the official ointments by Prof. Remington.

CHEMISTRY.

YEAR-BOOK OF PHARMACY

PART I.

CHEMISTRY.

Purification of Hydrochloric Acid. E. Bensemann. (*Archiv der Pharm.* [3], xxi. 291.) Hydrochloric acid may be entirely freed from arsenic by diluting it with water, adding potassium chlorate in small quantity, and warming the liquid. The acid which thus distils over contains free chlorine, but not a trace of arsenic.

Occurrence of Selenium in Hydrochloric Acid, and its Influence on Reinsch's Test. Dr. Drinkwater. (*Analyst*, December, 1883.) Selenium present in sulphuric acid passes over into the hydrochloric acid made with the latter. On boiling a piece of pure copper foil with this impure hydrochloric acid, a deposit was obtained which resembled in all outward appearance the arsenical deposit obtained in a similar manner in Reinsch's test. This, when heated in a dry test tube, yielded a sublimate of a distinct crystalline structure, which differed however from an arsenical deposit both in the form of the crystals and in its colour. The sublimate dissolved in concentrated sulphuric acid with the characteristic greenish brown colour, and was precipitated in red flakes on the addition of water.

Remembering that selenium is not such an uncommon impurity in sulphuric acid, and seeing the ease with which it is transferred to the hydrochloric acid, it becomes an important factor in using Reinsch's process for medico-legal purposes.

Preparation of Hydrobromic Acid. W. Grüning. (*Archiv der Pharm.*, August, 1883.) The author decomposes bromide of sodium or potassium with phosphoric acid of 1.304 sp. gr. at a boiling heat. The hydrobromic acid distils over.

Formation of Nitrous Acid in the Evaporation of Water. A. Scheurer-Kestner. (*Bull. de la Soc. Chim.* [2], xxxix. 289.) Warrington recently called attention to the formation of nitrous acid in the evaporation of water. The author shows that this observation was made a long time ago by Schoenbein, who described an experiment in which a piece of filter paper is cut into two parts, one of which is moistened with pure water and afterwards allowed to dry. This part of the paper will now give a distinct reaction for nitrous acid, while the other half will not.

Preparation of Phosphoric Acid by the Oxidation of Phosphorus with Air in Presence of Moisture. W. T. Wenzell. (*Journ. Chem. Soc.*, from *Pharm. Journ.*, 3rd series, xiv. 24-26.) Some years back Mohr suggested that phosphoric acid could be prepared by the oxidation of phosphorus with moist air, and effected it by placing sticks of phosphorus in glass tubes contracted at one end, several of these tubes being placed in a funnel, the end of which dipped into a flask of water. Doebereiner, with the same object in view, filled a flat porcelain dish to the depth of an inch with powdered glass, which was nearly covered with water, sticks of phosphorus being laid on the wet glass, so as not to touch one another, and the whole covered with a bell jar. These processes are not only impracticable but dangerous, on account of there being no arrangement for regulating the air supply. The author now suggests the use of infusion jars for this purpose; the sticks of phosphorus are laid on the diaphragm, and sufficient water is poured on to leave half the diameter of the sticks exposed. The lip of the jar is closed with an india-rubber stopper, whilst the top of the jar, which is ground even and smooth, is covered with a porous disc of plaster of Paris, which regulates the air supply. The phosphorus soon begins to oxidize, and after a week disappears to the surface of the water; the acid liquid is poured off, so as to expose more phosphorus, and the operation is continued until all the phosphorus is oxidized. For large quantities, the author proposes the use of shallow glazed pottery trays, which can be covered with a plaster of Paris tile, the phosphorus being arranged on cross bars, and the liquid run out by means of a tube let in at the side. Lead does not answer, on account of lead phosphate being formed.

The products of the oxidation are *phosphoric acid* in largest proportion, next *phosphorous acid*, *ozone*, and *hydrogen peroxide* in molecular proportions; and besides these, *ammonium nitrate* and *arsenic acid* are present in the final product. The ozone, hydrogen peroxide, and ammonium nitrate are the products of the oxidation

due, as the author suggests, to atomic oxygen, which is set free by the breaking up of the ordinary oxygen molecule to supply the phosphorus atoms with the uneven number of oxygen atoms required to form phosphoric and phosphorous anhydrides. The porous cover to the apparatus not only permits the gradual admission of air, but also dialyses the ozone from the hydrogen peroxide: the former diffuses through and can be recognised by the odour and by test paper, whilst the latter remains within the apparatus, forming the white vapour which is present during the oxidation. It runs into the liquid, and of course takes part in the oxidation; its presence is rendered evident by agitating some of the liquid with chromic acid and ether, etc.

The arsenic acid is got rid of by heating for a short time at 160° , when it is completely precipitated as metallic arsenic; at 170° and above, the phosphorous acid is decomposed into phosphoric acid and spontaneously inflammable hydrogen phosphide. The next operation is the conversion of the phosphorous acid into phosphoric: the acid solution is heated to about 130° , a small quantity is reserved, the remainder is treated with nitric acid until no more nitrous fumes are formed, and the excess of nitric acid is got rid of by adding the reserved portion of the acid solution. During this operation, nitric oxide is produced and acts as a carrier of oxygen, as it does in the sulphuric acid chambers, and thus economises the nitric acid; it is therefore advisable to add the nitric acid gradually, so as to avoid the escape of the nitrous fumes. The process is tedious.

Reduction of Nitrates by Ferments. A. Springer. (*Amer. Chem. Journ.*, March, 1883.) The author has noticed that when fermentation goes on in the presence of nitrates, a reduction of the latter takes place with evolution of nitric oxide. Infusions of parts of the tobacco plant were induced to ferment in four different ways, and not only the nitrates originally present were reduced, but also considerable quantities that were afterwards added. All the ferments contained one special organism, to the action of which the author thinks the reduction of the nitrates is due. It closely resembles the butyric ferment, being composed of small cylindrical rods with rounded extremities. Phenol appears to have no appreciable effect upon it. The conditions most favourable for its development are a temperature of $35-40^{\circ}$ C. and the presence of much water.

Hyponitrites. E. Divers and T. Haga. (From a paper read before the Chemical Society, January 17th, 1884.) In this paper the authors resume an investigation commenced by Divers in 1871. They criticise especially the results and conclusions of

Berthelot and Ogier, who gave to silver hyponitrite the formula $\text{Ag}_4\text{N}_4\text{O}_8$. These chemists do not seem to have thought that an acid of such a strange constitution as $\text{H}_4\text{N}_4\text{O}_8$ might be a mixture of hyponitrite, having Diver's constitution (HNO) mixed with nitrite and nitrate. The authors of the present paper have made many experiments purifying the hyponitrite in various ways. The final experiment consisted in dissolving the hyponitrite in nitric acid, precipitating with sodium carbonate, washing with water, acetic acid, and again with water; all the operations being performed in an atmosphere of carbonic acid. This resolution and reprecipitation was performed several times. The product was finally dried in an atmosphere of carbonic acid over sulphuric acid. The salt gave 77.69 per cent. of silver; AgNO contains 78.3 per cent. The constitution of the salt is therefore AgNO . The authors have hitherto failed to prepare hyponitrites either by Menke's method, heating potassium nitrate with iron filings, or by Zorn's process of using ferrous hydrate as the reducing agent.

The Specific Gravity of Concentrated Sulphuric Acid. G. Lunge and P. Naef. (*Die Chem. Industrie*, 1883, 37; *New Remedies*, August, 1883.) The authors have made a renewed investigation of this subject, under observance of all precautions and corrections insuring a reliable result.

The authors find that Kolb's figures coincide, below 90 per cent., with the values found by themselves so closely that they may be regarded as practically correct. Two observations were, however, made which are of importance. Kolb states that he succeeded, by careful repeated distillation, in obtaining an acid containing 99.72 per cent. of sulphuric anhydride. No other chemist had, before him, succeeded in this, and even the authors could not obtain, by the most careful evaporation *in vacuo*, a stronger acid (as *residue*) than 98.57 per cent. Further, it was shown that the specific gravity of the latter acid (98.57 per cent.), as obtained by evaporation, agreed almost absolutely (within 0.0003) with an acid prepared by mixing the calculated quantity of anhydrous sulphuric acid with a somewhat weaker acid; and that an acid of the latter kind (that is, one containing an excess of SO_3), as well as an acid approaching 100 per cent., has a *lower* specific gravity than a somewhat weaker acid, which observation confirms similar ones already made by F. and W. Kohlrausch.

The utility of Kolb's table being somewhat impaired by the absence of any data for the strongest sulphuric acid, the authors have now filled up the gap by the construction of the following

table, the last column of which gives the specific gravity and degrees by Baumé's scale of a commercial acid made at Uetikon, on the Lake of Zürich :—

Table of Percentage and Specific Gravity of the Strongest Sulphuric Acid at 15° C. (59° F.), reduced to Water at 4° C. and a Vacuum.

Percentage H ₂ SO ₄ .	Pure Acid.	Commercial Acid (Uetikon).	
	Spec. Grav.	Spec. Grav.	Baumé.
90	1.8185	1.8202	65.1°
*90.20	1.8195	...	...
*90.29	...	1.8219	...
91	1.8241	1.8254	65.4
*91.48	1.8271	...	...
92	1.8294	1.8306	65.6
*92.83	1.8334	...	...
93	1.8339	1.8346	65.8
94	1.8372	1.8374	65.9
*94.09	...	1.8375	...
*94.84	1.8387	...	...
95	1.8390	1.8397	66
*95.26	...	1.8404	66
*95.97	1.8406	...	...
96	1.8406	...	...
97	1.8410	...	...
*97.70	1.8413	...	...
97.75	...	1.8464	66.2
98	1.8412	...	...
*98.39	1.8406	...	...
*98.66	1.8409	...	...
99	1.8403	...	...
*99.47	1.8395	...	...
*100	1.8384	...	...

Below 90 per cent., Kolb's table may be used unhesitatingly for commercial acids.

Action of Carbonic Oxide on Steam. L. Maquenne. (*Bull. de la Soc. Chim.* [2], xxxix. 308-9.) This action is regarded by the author as resulting in the formation of carbonic anhydride and hydrogen, partly on the strength of thermo-chemical data, and partly on that of the observed formation of CO₂ in the decomposition of formic acid by electricity. The proportion of carbonic anhydride increases with the time of action.

Conversion of Carbonic Oxide into Carbonic Anhydride by Nascent Oxygen. A. R. Leeds. (*Chemical News*, xlviii. 25.) The author

* These figures were directly determined; the others by graphic interpolation.

refers to works which have been published in support of and against the theory that carbonic oxide is converted into carbonic anhydride during the oxidation of phosphorus in moist air; he then proceeds to describe the latest repetition of his original investigation in support of the theory. Sticks of phosphorus were put into a large, flat-bottomed bottle, fitted with a well ground stopper, filled with water free from air and carbonic anhydride, and inverted in a pneumatic trough. Well washed carbonic oxide and air, in equal volumes, were now introduced, sufficient water being left in the bottle to partially cover the phosphorus. The stopper was put in while the neck of the bottle was still under water; the bottle was then reversed, and kept at a temperature of 24° . After six days the gaseous mixture was withdrawn from the bottle; and the glass stopper being replaced by a cork saturated with paraffin, and fitted with the necessary tubes, the bottle was immediately inverted in a mercury trough, and a little mercury allowed to enter in order to cover the cork. The tubes were respectively connected with an aspirator and an air supply free from carbonic anhydride; and the issuing gas was passed through baryta-water and potassium iodide solution. The baryta-water soon became turbid, and was subsequently tested in a carbonic anhydride apparatus, when the potash bulbs in connection therewith had increased 0.0155 gram after the decomposition. The tube passing into the barium hydrate became incrustated; the incrustation when treated with acid evolved carbonic anhydride. There was no iodine set free in the potassium iodide solution, and therefore no ozone could have been present. The author considers, therefore, that the above statement is now established by a rigid quantitative and qualitative analysis.

Note on the Preparation of Marsh Gas. J. H. Gladstone and A. Tribe. (*Pharm. Journ.*, 3rd series, xiv. 792.) The authors described two reactions, in which marsh gas was produced free from other hydrocarbons by the action of the copper-zinc couple on methyl iodide in the presence of water or alcohol. The loss of methyl iodide was, however, considerable, varying from 23 per cent. to over 50 per cent. In the present note the authors describe a slight modification of the apparatus, by means of which this loss can be prevented. About 600 grams of thinly granulated zinc are immersed in a 2 per cent. solution of copper sulphate until the latter is decolorized. The copper-zinc couple is washed with water and finally with alcohol; it is introduced into a flask, the mouth of which is closed by a doubly perforated cork. Through the cork pass the end of a stoppered funnel containing the methyl iodide, and the

end of an upright wide glass tube, 12" long and 1" in internal diameter, filled with the copper-zinc couple. The upper end of this tube is also closed by a doubly perforated cork, into which fit a delivery tube and the end of a stoppered funnel containing alcohol. This upright tube serves the double purpose of a copper-zinc scrubber and an inverted condenser. A mixture of 20 c.c. of alcohol and 20 c.c. of methyl iodide being allowed to run into the flask, a steady evolution of marsh gas proceeds; the first litre was evolved in eight minutes, 7,053 c.c. were obtained, the theoretical yield being 7,100 c.c. The reaction can be much expedited by gently heating the flask.

Purification of Sulphuretted Hydrogen for Forensic Investigations. W. Lenz. (From *Zeitschr. für analyt. Chem.*) The author uses for this purpose a series of four washing bottles, set in a square upon a thick plate of iron, and heated during the experiment to 60–70°. Each of the bottles contains about 22 c.c. of liquid: that in the first is a mixture of 1 part of officinal hydrochloric acid and 2 parts of water; the second contains 1 part of such acid to 4 parts of water; the third 1 part to 8 of water; and the fourth pure water. The bottles are closed with corks, not caoutchouc stoppers. The connection is made with glass tubes or tubes of non-vulcanised india-rubber. Sulphuretted hydrogen washed in this manner can be passed for hours into warm dilute hydrochloric acid without producing a deposit of arsenic sulphide; whilst a current of gas evolved from the same materials, but washed only in water, gives an arsenical precipitate on being passed into dilute acid for half an hour.

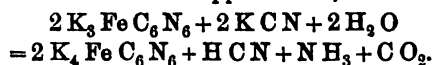
Preparation of Sodium Bicarbonate. H. Gaskell and F. Hurter. (*Dingl. polyt. Journ.*, ccli. 228.) For the preparation of sodium bicarbonate, the authors subject the anhydrous normal carbonate to the simultaneous action of steam and carbonic anhydride. The apparatus employed consists of a rotary cylinder, similar in construction to that used by Carey.

Potassium Carbonate. F. A. Flückiger. (*Ber. der deutsch. chem. Ges.*, xvi. No. 8.) The author refers to a potassium carbonate which he described in 1856 in the *Schweizerischen Zeitschrift für Pharmacie*. It was formed as an efflorescence in an open earthenware box which had contained crude potash. It formed white crystalline needles permanent in the air; its solution in water did not precipitate magnesium sulphate. The salt, though formed from crude potash, contained neither chlorine nor sulphuric acid. He considers that it contains a pyrocarbonic acid or polycarbonic acid, $C_3 H_4 O_3$.

The Reduction of Potassium Ferricyanide by Potassium Cyanide.
C. L. Bloxam. (*Chemical News*, xlviii. 73.) Crystallized KCN (containing but little K_2CO_3) was dissolved in water, the solution heated in a retort, and potassium ferricyanide added. The green colour of the latter changed to yellow, and the distillate contained much hydrocyanic acid and ammonium carbonate, the latter increasing in quantity towards the end of the distillation.

A small quantity of the cyanide effected the reduction of a large quantity of the ferricyanide. On cooling, the solution deposited abundant crystals of potassium ferrocyanide. The mother-liquor was nearly neutral when the reaction was complete, and contained only minute quantities of cyanate and formate of potassium.

The principal reaction would appear to be,—



This may be represented as taking place in three stages :—

- (1) $2K_3FeCy_6 + 2KCN = 2K_4FeCy_6 + 2CN.$
- (2) $2CN + H_2O = HCN + HCN O.$
- (3) $HCN O + H_2O = NH_3 + CO_2.$

When some of the same sample of KCN was distilled with water alone, much HCN was found in the distillate, and some NH_3 , but no CO_2 . The liquid in the retort, even after repeated distillation with water, contained much undecomposed cyanide, together with potassium hydrate, potassium carbonate, and a little formate.

Specific Gravities of Solutions of Ammonia and Ammonium Carbonate. J. H. Smith. (*Dingl. polyt. Journ.*, cxxlvii. 504; *Journ. Chem. Soc.*, 1883, 849.) From a suggestion by Lunge, the author was led to determine the sp. gr. of pure ammonia solutions (standardised with normal hydrochloric acid and methyl orange) at 14° , by means of a pyenometer; the results are compared with water and reduced to a vacuum :—

Sp. gr. at 14° .	Percentage of Ammonia (NH_3), according to						
	Smith.	Carius.	Wach-smuth.	Otto.	Ure.	Dalton.	Davy.
0.8983	31.0	31.8	29.9	—	27.8	24.0	27.6
0.9116	23.8	24.6	23.8	—	23.1	19.5	23.6
0.9246	20.8	20.2	19.7	—	19.4	16.4	19.8
0.9400	15.1	15.4	15.0	—	14.7	12.9	15.5
0.9536	11.7	11.7	11.3	11.5	11.8	10.2	11.8
0.9780	5.1	5.2	4.9	5.2	5.0	4.5	—

Solutions of commercial ammonium carbonate, which contained 31·3 per cent. NH_3 , 56·6 per cent. CO_2 , and 12·1 per cent. H_2O , corresponding approximately with the formula, $\text{H} \cdot \text{NH}_4 \cdot \text{CO}_3 + \text{NH}_4 \cdot \text{CO}_3 \cdot \text{NH}_2$, gave,—

Degrees. Tw.	Sp. gr. at 15°.	Percent. Ammonia Carbonate.	Change of the sp. grs. for + 1°.
1	1·005	1·66	0·0002
2	1·010	3·18	0·0002
3	1·015	4·60	0·0003
4	1·020	6·04	0·0003
5	1·025	7·49	0·0003
6	1·030	8·98	0·0004
7	1·035	10·35	0·0004
8	1·040	11·86	0·0004
9	1·045	13·36	0·0005
10	1·050	14·38	0·0005
11	1·055	16·16	0·0005
12	1·060	17·70	0·0005
13	1·065	19·18	0·0005
14	1·070	20·70	0·0005
15	1·075	22·25	0·0006
16	1·080	23·78	0·0006
17	1·085	25·31	0·0006
18	1·090	26·82	0·0007
19	1·095	28·33	0·0007
20	1·100	29·93	0·0007
21	1·105	31·77	0·0007
22	1·110	33·45	0·0007
23	1·115	35·08	0·0007
24	1·120	36·88	0·0007
25	1·125	38·71	0·0007
26	1·130	40·34	0·0007
27	1·135	42·20	0·0007
28	1·140	44·29	0·0007

Preparation of Ammonium Sulphocyanide. J. Schulze. (*Journ. für pract. Chem.*, xxvii. 578.) The author recommends for this purpose the action of ammonia upon carbon bisulphide in alcoholic solution, as already proposed by Millon. From 600 grams of alcohol (95 per cent.), 800 grams of ammonia solution (sp. gr. 0·912), and 350 grams of carbon bisulphide, the author obtained 280 grams of dry ammonium sulphocyanide.

Preparation of Barium Permanganate. G. Rousseau and B. Bruneau. (*Comptes Rendus*, January, 28, 1884.) The authors decompose a cold saturated solution of potassium permanganate with hydrofluo-silicic acid, filter through asbestos, and saturate the filtrate with milk of baryta. They think that most of the permanganates may be prepared in an analogous manner.

Barium Oxychloride. G. André. (*Comptes Rendus*, March 3, 1884; *Chemical News*, xlix. 178.) The author has obtained this compound in a definite state, not mixed either with an excess of base or of chloride. He takes 200 grams of barium chloride, dissolved in 500 grams of boiling water, withdraws the flask from the flame, and incorporates with the liquid 30 grams of caustic baryta, well pulverised; he next heats again for five minutes without boiling, and filters. The oxychloride, $\text{Ba Cl, Ba O } 5 \text{ H O}$, crystallizes in a few hours in nacreous laminæ.

The Constitution of Bleaching Powder. G. Lunge and P. Naef. (*Liebig's Annalen*, cccix. 129-161.) As Kraut has recently taken up the subject of the constitution of bleaching powder, directing a polemical paper against the investigations of Lunge and Schaeppi, the authors have repeated their former experiments, and those of Kraut, with a view of establishing the correctness of the formula Ca Cl. Cl O , first proposed by Odling. In their former paper great stress was laid on the complete and ready expulsion of all the chlorine in bleaching powder by carbonic anhydride in the presence of a little moisture, as militating against the presence of free calcium chloride. Kraut has shown that calcium chloride, when treated with a mixture of hypochlorous anhydride and carbonic anhydride, forms calcium carbonate, thus: $\text{Ca Cl}_2 + \text{Cl}_2 \text{ O} + \text{C O}_2 = \text{Ca C O}_3 + 2 \text{ Cl}_2$, and concludes from this that calcium chloride is present as such in bleaching powder. But the authors point out that this reaction can equally be explained by the intermediate formation of bleaching powder and its subsequent decomposition, thus: $\text{Ca Cl. H O} + \text{H Cl O} = \text{H}_2 \text{ O} + \text{Ca Cl. Cl O}$, and $\text{Ca Cl. Cl O} + \text{C O}_2 = \text{Ca C O}_3 + \text{Cl}_2$. To prove the correctness of their interpretation, a series of experiments were conducted in which pure hypochlorous anhydride was passed over pure calcium hydroxychloride, Ca Cl. H O ; the resultant material always contains a considerable proportion of bleaching powder (mixed with unaltered chloride and traces of chlorate), which can be subsequently decomposed by carbonic anhydride. Kraut's experiments are therefore inconclusive.

Separation of Calcium and Strontium. M. D. Sidersky. (*Zeitschr. für analyt. Chem.*; *Chemical News*, xlviii. 296.) The method of separating these two metals is based on the following reaction:—When a mixture of oxalate and sulphate of ammonium is added to a salt of strontium containing calcium, the precipitate contains all the strontium in the form of sulphate, whilst the whole of the calcium is found in the form of oxalate. These two salts are then

easily separated by dilute hydrochloric acid. By previously adding a little hydrochloric acid to the solution, the precipitation of calcium oxalate is prevented.

The method of working is as follows: Suppose a strontianite is to be analysed. The powdered mineral is dissolved at the boiling point by the smallest possible quantity of strong hydrochloric acid, and the solution supersaturated with ammonia, which precipitates iron, alumina, and silica. After filtration the liquid is concentrated by evaporation, acidulated with hydrochloric acid, and precipitated by a solution containing 200 grams of sulphate and 30 grams of oxalate of ammonium per litre. This precipitates sulphate of strontium, which is collected on a filter and weighed after washing. The filtrate, supersaturated with ammonia, yields a precipitate of oxalate of calcium.

The analytical results which the author quotes in support of this method are satisfactory.

Solubility of Calcium Hydrate in Water at Different Temperatures. T. Maben. (From a paper read before the North British Branch of the Pharmaceutical Society, December 19, 1883. *Pharm. Journ.*, 3rd series, xiv. 505.) The author's results are embodied in the following table :—

Temperature. Degrees C.	Expressed in grains CaO per fluid ounce.	Expressed as 1 part CaO in parts of water.	Expressed as parts CaO in 100 parts water.
0	·576	759	·181
5	·572	764	·180
10	·568	770	·129
15	·561	779	·128
20	·553	791	·126
25	·526	881	·120
30	·507	862	·116
35	·481	909	·109
40	·469	932	·107
45	·444	985	·101
50	·429	1019	·098
55	·396	1104	·09
60	·385	1136	·088
65	·362	1208	·082
70	·354	1235	·08
75	·333	1318	·076
80	·321	1362	·078
85	·315	1388	·072
90	·277	1579	·063
95	·265	1650	·06
99	·265	1650	·06

The author has fully convinced himself that the presence of

calcium carbonate considerably interferes with the solubility of the hydrate, even when the latter is present in more than sufficient quantity to saturate the water; but he offers no explanation of this peculiar fact.

Bismuth Pentoxide (Bismuthic Acid). C. Hoffmann. (*Liebig's Annalen*, cccxiii. Part I. From *Chemical News*.) The highest oxide of bismuth has the composition Bi_2O_5 . Its potassium compounds are formed when bismuth hydrate is suspended in potash lye of sp. gr. 1.589, chlorine is introduced in the cold, and after the addition of more potash lye the liquid is boiled until it has an alkaline reaction. This process is repeated three times with the bismuth compound, using fresh quantities of the lye. The potassium bismuthates thus obtained are of the general type, $2\text{BiO}_3\text{K} + n\text{Bi}_2\text{O}_5$; they vary from a red-brown to a deep violet-brown in colour, and they are richer in potassium the stronger the lye employed. If treated with boiling water, they pass into salts poorer in potassium and of a lighter colour. All these compounds are anhydrous. If bismuth hydrate is suspended in lye so strong that it solidifies on cooling, and treated with chlorine at a boil, yellow and red compounds are obtained in which the bismuth is partly pentavalent and partly trivalent.

Bismuth Salicylate. L. Wolff. (*Amer. Journ. Pharm.*, November, 1883.) In a recent number of the *American Journal of Pharmacy* mention was made of this article as a new remedial substance, along with an interesting account of its use and some of its properties. The *New Remedies*, as well, had notes upon the subject in both the September and October numbers, giving therein also directions for its preparation, which, however, are not sufficient to obtain a pure salicylate, but only a mixture of the subnitrate and salicylate.

The author recommends the following process as yielding a very satisfactory preparation:—A concentrated solution of sodium salicylate is added to a glycerin solution of crystallized bismuthous nitrate, and the precipitate washed with cold water, subsequently with hot water, and finally with alcohol, in order to free it from salicylic acid. As the glycerin solution named bears moderate dilution with water without precipitation, the contamination of the product with subnitrate is thus avoided. Prepared in this manner, salicylate of bismuth presents a slightly pinkish appearance and is of a granular consistence, which is not readily converted into an impalpable powder in the mortar. Under the microscope it is easily distinguishable from the subnitrate by being of a distinct granular

character, the granules of even size reminding of the conidia of fungoids, while the former consists of uneven broken crystals.

In water, glycerin, alcohol, and ether it seems insoluble, while its solution in acids is probably due to its decomposition and formation of bismuthous salts. Tests for its purity are: the absence of acid reaction of water boiled with it (salicylic acid); its rapid combustion on platinum foil, with liberation of phenic odours free from nitrous acid vapours; and lastly, its distinct granular appearance, without crystalline fragments, under the microscope (bismuthyl nitrate).

Hypophosphate of Silver. J. Philip. (*Ber. der deutsch. chem. Ges.*, xvi. 749-752.) The author obtains this substance by the following process:—

Six grams of silver nitrate are dissolved in 100 c.c. of nitric acid (sp. gr. 1.2), diluted with 100 c.c. water, and heated on the water-bath. 8-9 grams of phosphorus are introduced; when at a little below 100° a violent reaction takes place, the phosphorus being oxidized to phosphorous, phosphoric, and hypophosphoric acids, of which (if the phosphorus be maintained in excess, and the reaction stopped as soon as the violent evolution of gas ceases) the hypophosphate crystallizes out, the phosphorous and phosphoric acid remaining in solution. When silver hypophosphate is heated, it decomposes into metallic silver and silver metaphosphate.

New Silver Compound. T. Poleck and K. Thümmel. (*Ber. der deutsch. chem. Ges.*, xvi. 2435-2448; *Journ. Chem. Soc.*, 1884, 156.) Gutzeit has shown (*Pharm. Zeit.*, 1879, 263) that when gases containing arseninretted hydrogen impinge on a piece of filter-paper moistened in its centre with one drop of a concentrated solution of silver nitrate, the wet spot assumes a lemon-yellow colour, whilst at the periphery a brownish black ring forms, which slowly broadens towards the centre until the whole spot becomes black. If the spot, whilst still yellow, is moistened with water, it blackens over the whole surface, and at the same time shows a strongly acid reaction. Hydrogen sulphide, phosphide, and antimonide give similar results. The present paper details experiments on the chemical nature of these reactions.

Hydrogen sulphide is passed into a concentrated solution of silver nitrate (1 part AgNO_3 in 0.7-1.0 part water) kept constantly agitated, when a yellowish green precipitate, of the formula Ag_2S , AgNO_3 , is obtained. The supernatant liquid has a strongly acid reaction, does not contain sulphuric acid, and yields a considerable quantity of ammonia when distilled with potash. The precipitate can be heated to 180° without decomposition, and then forms a

dark green powder. It is decomposed into silver nitrate and silver sulphide by treatment with water or alcohol. On oxidation with nitric acid of sp. gr. 1.18 an orange-red coloured powder is frequently obtained. This compound is also obtained by the action of sulphur on a boiling concentrated solution of silver nitrate, and after purification gave results corresponding with the formula Ag_2S , Ag_2SO_4 . It dissolves in boiling nitric acid, is decomposed by boiling water into silver sulphide and sulphate, and by cold hydrochloric acid into silver sulphide and chloride.

Arsenic trihydride, acting on dilute solution of silver nitrate, has long been known to yield metallic silver, arsenious anhydride, and nitric acid; with a concentrated solution, however, the reaction is very different. The first few bubbles of gas produce a deep lemon-yellow coloration, no precipitate is formed, and the liquid acquires an acid reaction; this coloration remains for one or two days, then the liquid becomes colourless, silver is precipitated, and the solution contains arsenious and arsenic acid.

If a rapid stream of arsenic trihydride be passed into a concentrated solution of silver nitrate at 0° , the whole liquid solidifies to a yellow crystalline mass, but rapidly blackens from separation of silver. Many experiments were tried to isolate the compound, but its instability was too great. Analysis by an indirect method pointed to the formula Ag_3As , 3Ag N O_3 .

With concentrated solutions of silver nitrate, hydrogen phosphide gave results exactly similar in appearance to those obtained with arsenic trihydride. The composition of the yellow precipitate from indirect determinations was Ag_3P , 3Ag N O_3 .

A yellow precipitate is also obtained by the action of antimony trihydride on a concentrated solution of silver nitrite. It could not be isolated, but indirect determinations gave the formula Ag_3Sb , 3Ag N O_3 . Unlike arsenic, phosphorus, and sulphur, metallic antimony does not yield the double compound; when it is placed in a solution of silver nitrate, Ag_3Sb is first formed, but is soon converted into antimonious oxide and silver.

Ammonio-Nitrates of Silver. A. Reychler. (*Ber. der deutsch. chem. Ges.*, xvi. 990-994. From *Journ. Chem. Soc.*) Two compounds of silver nitrate with ammonia are known, viz., Ag N O_3 , 3N H_3 , and Ag N O_3 , 2N H_3 . A strongly acid solution of silver nitrate is not precipitated by ammonia, whilst from a neutral or nearly neutral solution the silver is partially thrown down as hydrated oxide. To re-dissolve the precipitate, slightly more ammonia must be used than is required by the proportion $\text{Ag N O}_3 +$

2 N H₃. If sufficient ammonia is added to produce only a slight precipitate, and the latter is then separated by filtration, the further addition of ammonia produces no precipitate. On adding ammonia in quantity sufficient to produce the maximum precipitate, and evaporating the filtrate on a water-bath, a brown deposit (Ag O P) is formed, and silver is precipitated in the form of a mirror, whilst the concentrated solution crystallizes on cooling to a mass of lustrous needles; these, after washing with alcohol and ether, should be dried at a low temperature. The product, *silver ammonium nitrate*, N H₃ Ag. N O₃, blackens by exposure to light, and is only partially soluble in water, moderately in alcohol, very sparingly in ether. On dialysing a concentrated solution of silver ammonium nitrate into water, white needles are obtained on the lower side of the dialyser, which after being washed with alcohol and ether, and dried at a low temperature, contain 77 per cent. silver, which approximately corresponds with silver ammonium hydroxide. Silver ammonium nitrate forms a crystalline compound with aldehyde, C H₃. C H(O H). N H Ag, very readily soluble in water, moderately in alcohol, and almost insoluble in ether. It blackens by exposure to light and is decomposed below 100°. On adding aldehyde to a solution of silver nitrate and ammonia containing 1 mol. of the former to 2 mols. of the latter, it yields Liebermann and Goldschmidt's ethyldienimide silver nitrate.

Silver Nitrocyanide. C. L. Bloxam. (*Chemical News*, xlviii. 154.) The author has examined the crystalline compound obtained by dissolving pure silver cyanide in a nearly saturated boiling solution of silver nitrate. It is anhydrous, and is decomposed by water into silver cyanide and nitrate. Analysis gives 68·09 per cent. total silver, determined in nitric acid solution of the compound; 22·97 per cent. silver as cyanide, determined in residue from decomposition with water; 45·64 per cent. silver as nitrate, determined in aqueous extract. Its constitution is therefore, Ag Cy, 2 Ag N O₃, and not Ag N O₃, 2 Ag Cy, as is generally supposed.

The Action of Solution of Ammonia upon Mixtures of Silver Chloride and Bromide. A. Senier. (*Pharm. Journ.*, 3rd series, xiv. 1.) The results of the author's experiments lead to the following conclusions:—

The solubility of silver chloride is not the same when mixed with silver bromide. The solubility of moist freshly precipitated silver chloride in ammonia solution (10 per cent. N H₃) is 1 gram in 17 c.c., and of silver bromide is 1 gram in about 250 c.c. The solubility of the chloride in presence of bromide is much less; so that when the

proportion of bromide is one half or more, it is on the whole 1 in 50. Silver bromide is insoluble in a solution of silver chloride in ammonia, 1 in 50. Silver chloride displaces silver bromide from its solution in ammonia. But the unavoidable errors of experiment preclude the use of these facts in quantitative analytical separation of the two acid radicals.

Action of Water on Zinc. T. Stevenson. (*Chemical News*, xlix. 107.) Attention is called by the author to the action of soft waters on metallic zinc, and to the possible injurious effects of water thus contaminated on the health of the consumer.

Double Salts of Lead. G. André. (*Comptes Rendus*, xcvi. 1502-1504. From *Journ. Chem. Soc.*) If litharge is added gradually to a hot solution of ammonium chloride in its own weight of water, and heated at about 100° for some hours, the liquid on cooling deposits crystals of the composition $\text{Pb Cl}_2, 6 \text{ N H}_4 \text{ Cl}, \text{H}_2 \text{ O}$. This compound is decomposed by water with formation of an amorphous oxychloride, $\text{Pb Cl}_2, \text{Pb O}, \text{H}_2 \text{ O}$, and a solution which, after concentration, deposits small brilliant micaceous lamellæ of the composition $2 \text{ Pb Cl}_2, \text{N H}_4 \text{ Cl}, 6 \text{ H}_2 \text{ O}$.

If a small quantity of the compound, $\text{Pb Cl}_2, 6 \text{ N H}_4 \text{ Cl}, \text{H}_2 \text{ O}$ is heated with about 50 c.c. of water in a sealed tube at about 200° for five hours, white needles of the oxychloride, $\text{Pb Cl}_2, \text{Pb O}, \text{H}_2 \text{ O}$, are obtained. If some of the mother-liquor from $\text{Pb Cl}_2, 6 \text{ N H}_4 \text{ Cl}, \text{H}_2 \text{ O}$ is added to an excess of water, and the mixture heated in a sealed tube at 200° for about five hours, small slender brilliant needles of the oxychloride, $2 \text{ Pb Cl}_2, \text{Pb O}, 2 \text{ H}_2 \text{ O}$, are deposited. When the salt, $4 \text{ Pb Cl}_2, 22 \text{ N H}_4 \text{ Cl}, 7 \text{ H}_2 \text{ O}$, previously described, is heated with water in a similar manner, lead chloride separates out in slender needles, but no oxychloride is formed. It would appear, therefore, that the double chlorides obtained by the action of litharge on a solution of ammonium chloride contain a small quantity of oxychloride, which is easily separated by water, and crystallizes under pressure. This oxychloride is probably formed in accordance with the equation $2 \text{ Pb O} + 2 \text{ N H}_4 \text{ Cl} = 2 \text{ N H}_3 + \text{Pb Cl}_2, \text{Pb O}, \text{H}_2 \text{ O}$.

When lead bromide is added to an aqueous solution of ammonium bromide until it ceases to be dissolved, the liquid deposits crystalline nodules of the composition $7 \text{ Pb Br}_2, 12 \text{ N H}_4 \text{ Br}, 7 \text{ H}_2 \text{ O}$, which rapidly alter when exposed to air. The mother-liquor, after evaporation, deposits small lamellæ of the composition $2 \text{ Pb Br}_2, 14 \text{ N H}_4 \text{ Br}, 3 \text{ H}_2 \text{ O}$, much more stable when exposed to air. By digesting litharge with ammonium bromide solution, a crystalline crust of the composition $\text{Pb Br}_2, 6 \text{ N H}_4 \text{ Br}, \text{H}_2 \text{ O}$, is obtained. It

is decomposed by water with formation of an amorphous oxybromide, 2Pb Br_3 , 2Pb O , $3 \text{H}_2 \text{O}$. By treating the double salt, Pb Br_3 , $6 \text{N H}_4 \text{Br}$, $\text{H}_2 \text{O}$, or its mother-liquor, in the same manner as the chlorine compounds, the oxybromide, Pb Br_3 , Pb O , $\text{H}_2 \text{O}$, is obtained in slender needles. It would appear that the double bromides obtained by the action of litharge on ammonium bromide solution, contain some oxybromide; but the compounds obtained from lead bromide and ammonium bromide yield only lead bromide, and no oxybromide, when heated with water in sealed tubes.

Process for Preparing Litharge and Red Lead. (*Dingl. polyt. Journ.*, cxxlviii. 220.) According to Lewis, the fumes from lead smelting furnaces are mixed with carbonate or caustic soda, and roasted or boiled. The whole is then allowed to settle, washed to free it from sodium sulphate, and smelted to form either litharge or red lead. If the fumes contain zinc, the latter must first be dissolved out with sulphuric acid.

Yellow and Red Oxide of Lead. A. Genther. (*Liebig's Annalen*, cccix. 56; *Journ. Soc. Chem. Ind.*, 1884, 179.) By heating red oxide of lead (chrysis, goldglätte) to its fusing point, it is resolved into the yellow oxide (argyritis, silberglätte). A similar result is obtained when the salts of lead, which lose their acids at this temperature, are heated, *e.g.*, the carbonates and nitrates. The resulting yellow oxide, after fusion and rapid cooling, solidifies into a mass of crystalline laminae. By fusing the hydrate with potassium hydrate, and quickly cooling, the yellow oxide is obtained in a crystalline state; likewise by introducing a boiling solution of a lead salt into boiling soda ley ($1 \text{Na}_2 \text{O} + 5 \text{H}_2 \text{O}$), or hot milk of lime. Large transparent lamellar crystals, of fine lustre and yellow colour, are formed by adding to a boiling solution, consisting of 7 parts of potassium hydrate and 14 parts of water (boiling point, 110°), 1 part of finely-pulverised hydrated oxide of lead. The mixture is kept at this temperature until nearly all the lead has been dissolved, after which the solution is allowed to cool gradually. The formation of a red-coloured oxide of lead from the hydrate begins at 110° , and in order to complete the same it is necessary to raise the temperature to 150° , and conduct the heating in a closed crucible. For the conversion of the carbonate into the red oxide a high temperature is required. To obtain the red oxide in the form of lamellar garnet-red crystals, it is recommended to dissolve 1 part of the hydrate in 5 parts fused potassium hydrate, and slowly cool the mixture. By boiling the hydrate in a solution of 3 parts sodium hydrate and 4 parts water (boiling point 130°), red crystalline

hydrated oxide of lead is obtained. The yellow oxide has a specific gravity of 9.28 to 9.36, the red 8.74 to 9.126. The former crystallizes in rhombs, the latter in a tetragonal form. It is further shown that at the ordinary temperature the yellow oxide may be resolved into the red by pressure and friction, whilst to convert the red oxide into the yellow it is necessary to heat the same almost to the fusing point. By fusing the oxide with potassium hydrate with access of atmospheric oxygen, a compound of peroxide of lead and potash is deposited, on cooling, in the form of light-brown six-sided tables.

Basic Sulphates of Copper. S. U. Pickering. (*Chemical News*, xlvii. 181.) In previous communications the author has shown that the metals iron and aluminium do not form as many basic sulphates as they were supposed to do. He has now examined the basic sulphates of a metal belonging to a different class, viz., copper, and has found not six but only two basic sulphates of this metal. The one, $6\text{CuO}, 2\text{SO}_3 + 5\text{H}_2\text{O}$, is precipitated in small quantity when a neutral solution of copper sulphate is boiled, the precipitation being complete in ten minutes. In this manner, from 0.37 to 2.5 per cent. of the copper present can be precipitated, the quantity increasing with the dilution of the solution. The second basic sulphate, $4\text{CuO}, \text{SO}_3$, is formed when a solution of copper sulphate is precipitated with less than 1.5 mol. of potassium hydroxide to 1 mol. of copper sulphate, or with sodium acetate, or when copper hydrate (dried at 100°C .), or the precipitate obtained by adding excess of potash to copper sulphate, is digested with a 10 per cent. solution of copper sulphate. This basic sulphate is very sparingly soluble in water (0.017 gram in 1,000 c.c.). When, however, the solution is boiled, it becomes dark, owing to the separation of copper hydroxide. It remains unaltered when exposed to air or boiling water. This latter property serves as a test for the sulphate, $4\text{CuO}, \text{SO}_3$, for those containing more CuO soon become blackened when boiled with water. No definite basic sulphate is formed either by heating normal copper sulphate, or by diluting an ammonio-copper sulphate solution.

Preparation of Zinc Free from Arsenic. F. Stolba. (*Chemical News*, xlix. 150, from *Berichte Bœhm. Gesell. Wissen*.) Zinc, free from arsenic and almost free from iron, can be readily obtained from the commercial metal by exposing it simultaneously to the action of sulphur and aqueous vapour in such a manner that these agents rise from the bottom of the crucible through the melted metal.

Burnt gypsum is mixed with a fourth of its weight of coarsely

powdered sulphur, and the mixture is made up to a paste with the necessary quantity of water. Of this balls are moulded about 5 centimetres in diameter, and fixed, when dry, to the end of wooden rods of sufficient length and strength, so that they remain fast. When dry, the balls are ready for use. They are then pressed down into the melted metal to the bottom of the crucible. Abundant fumes of sulphur and water are given off, and cause an agitation in the melted metal, so that caution is necessary. When the agitation ceases the ball is withdrawn, the scum is removed from the surface, and the operation is repeated as required. One kilo. of zinc may be advantageously treated at once. The zinc thus purified is quite free from arsenic, and contains very slight traces of iron. The lead is also much diminished.

Arsenic in Mineral Waters. J. Lefort. (*Journ. de Pharm. et de Chim.*, February, 1884.) Mineral waters in which bicarbonates, sulphates, or chlorides are the predominating constituents, contain the arsenic in its highest state of oxidation; whereas in waters containing sulphuretted hydrogen, the arsenic occurs only in the arsenious state.

Arsenic in Glass as a Source of Error in Forensic Investigations. W. Fresenius. (*Zeitschr. für Analyt. Chem.*, 1883, 397; *Chemical News*, xlviii. 147.) Whilst in toxicological researches the various reagents employed are generally tested for arsenic with great care, no one seems to have suspected the presence of arsenic in the glass apparatus used as a possible source of error in such investigations. Such a result, however, appears, according to the author's observations, perfectly possible. It is well known that arsenious acid is often used in the manufacture of glass, as a decolorizing agent, and it seems that latterly arsenic is more generally and more abundantly present in glass, whether from a more copious addition of arsenious acid, or from the use of strongly arseniferous materials. The author's attention was first drawn to this subject when testing a precipitate formed by sulphuretted hydrogen for arsenic by Fresenius and Babo's process. The bulk of the precipitate, mixed with soda and potassium cyanide, placed in a tube of Bohemian glass, was heated in a current of carbonic acid for a short time and not too violently. There appeared only a very slight arsenical deposit. On repeating the experiment with the smaller residual portion of the precipitate, heating more strongly and for a longer time in a tube of the same glass, an extremely strong arsenical mirror was obtained. This phenomenon led to the supposition that the latter mirror was due to the glass

which had been attacked by the melting mixture of potassium cyanide and sodium carbonate. To test this supposition the author made a blank experiment in a tube of the same glass, with a mixture of sodium carbonate and potassium cyanide perfectly free from arsenic. The result perfectly verified the supposition: if the heat was short and feeble there was no deposit, but after prolonged and vigorous heating a very strong mirror appeared in the tube. The author then examined certain kinds of glass for arsenic, and studied the influence which this impurity may have in the various methods for determining arsenic. The qualities tried were a Bohemian glass, with which the foregoing experiments had been made, containing 0.20 per cent. of arsenic and 0.05 of lead; a refractory glass from Thüringen containing 0.08 arsenic and 0.96 lead, and a third refractory glass containing per gramme a quantity of arsenic not weighable, and 0.09 per cent. of lead. On making blank experiments as above with all these three kinds of glass, mirrors were obtained, that with the last kind being by far the slightest.

If the mixture was placed in a porcelain boat which had been previously ignited, and was thus prevented from coming in direct contact with the glass, the experiment being otherwise conducted exactly according to Fresenius and Babo's method, no arsenical mirror was obtained, even on intense and prolonged heating. Pure sodium carbonate alone, if heated in a current of pure hydrogen gas, gave an arsenical mirror with all three kinds of glass, though very slight with the last-mentioned kind. A current of pure hydrogen alone produced no arsenical mirror, but with the two first-mentioned kinds of glass there was produced a brown coloration at the spot where the flame played directly upon the glass. This browning has generally been attributed to the presence of lead, but the author considers it due to arsenic, as it was strongest in the Bohemian glass, which contained much arsenic but little lead, and did not appear at all in the third, which contained twice as much lead and a mere trace of arsenic.

Further experiments were made to show whether aqueous solutions of acids or alkalis were capable of taking up arsenic from glass. It was found that such an extraction is possible in case of alkaline liquids, but is not to be apprehended with acids.

The presence of arsenic in the glass is not likely to lead to error in the Marsh process, as it would be detected in the preliminary examination before adding the suspected substance.

In the Fresenius and Babo process the substance, with the reduction mixture, should be placed in a porcelain boat, introduced

into a tube of glass as free as possible from arsenic, and cautiously dried in the current of carbon dioxide before applying a high temperature. The author finally remarks that non-arsenical glass was formerly a common article of commerce, though it cannot now be procured.

Note on Ferric Sulphocyanate. A. J. Shilton. (From a paper read before the Chemical Society, May 15th, 1884.) The author finds that if a drop of dilute ferric chloride be allowed to fall into a solution of potassium sulphocyanide, the red colour at first formed is completely discharged. Also that a liquid containing enough ferric sulphocyanate to render it almost opaque is completely decolorized if boiled with an excess of hydrochloric acid. These effects are readily explained by the fact that the sulphocyanide is a powerful reducing agent.

Behaviour of the Acetates of Chromium, Iron, and Aluminium. B. Reinitzer. (*Chemical News*, xlviii. 114. From *Zeitschr. für Analyt. Chem.*) If a solution of chromium sulphate or chloride is mixed with an excess of sodium acetate, and boiled, no deposit is formed even after hours of ebullition, however concentrated the solution, and however much sodium acetate is added. If the solution is boiled for a short time only, it takes on cooling a violet colour.

The solution of a chromic salt thus treated is found to have assumed decidedly new properties. Caustic alkalies, ammonia, ammonium sulphide and carbonate, alkaline carbonates, sodium phosphate, baryta-water, and barium carbonate produce in the cold not the slightest turbidity, whether added in small quantities or in excess. Caustic alkalies and baryta change the colour of the solution, at first to an olive-green, and then to an emerald-green, and after standing for twelve hours the liquid congeals to a green jelly. On adding ammonia no immediate change of colour occurs; after about forty-eight hours the liquid is converted to a violet jelly. Ammonium sulphide and carbonate act in the same manner after the lapse of several days. If the mixture is boiled after the addition of the above-mentioned reagents, there appears, according to the strength of the alkaline reaction and the quantity added, sooner or later a precipitate; sodium phosphate alone occasions no deposit.

If the solution contains, along with chromic oxide, ferric oxide and alumina, the chromium acetate imparts its passivity to certain quantities of the ferric and aluminium acetates. Neither by ebullition nor by the addition of caustic alkalies, ammonia, etc., can certain quantities of ferric and aluminium acetate be detected in presence of chromic acetate. Ammonium sulphide makes an

exception as far as iron is concerned, since it effects a slow but complete precipitation of iron sulphide. A given quantity of chromium can preserve a given quantity of iron and alumina from precipitations, but larger quantities only if the solution of chromium has been boiled with the sodium acetate before the addition of the solution of iron and aluminium.

If the chromic solution is merely mixed with sodium acetate in the cold, the chromium can at first be precipitated in the cold by the above-named reagents. On standing for a day the liquid acquires the same passivity as it would have done on boiling.

From the above it appears that the method of separating ferric and aluminium salts in the form of basic acetates entirely loses its applicability in presence of chromic salts.

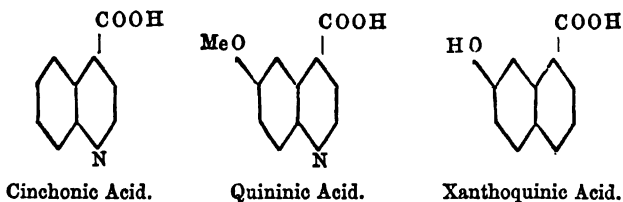
Constitution of Quinine and Quinidine. Z. H. Skraup. (*Monatsh. für Chem.*, iv. 695; *Journ. Chem. Soc.*, 1884, 86.) The author has already shown (see *Year-Book of Pharmacy*, 1882, 64) that these two alkaloids, when oxidized by chromic acid, yield carbonic anhydride and quininic acid, $C_{11}H_9NO_3$, which latter, when heated with hydrochloric acid, gives methyl chloride and xanthoquinic acid, $C_{10}H_7NO_3$, resolvable by heat into CO_2 and a hydroxyquinoline, $C_9H_7NO = C_9H_6(OH)N$; further, that quininic acid is converted by oxidation with permanganate into a pyridine-tricarboxylic acid, $C_8H_5N(COOH)_3$, identical with that which is obtained from cinchoninic acid; hence it is probable that quininic acid is a derivative of quinoline, and that its methyl-group is situated in the benzene residue of the quinoline molecule; hence also it may be inferred that the hydroxyquinoline obtained from xanthoquinic acid has its hydroxyl-group situated in the benzene residue. According to existing views there should be only four hydroxyquinolines thus constituted. Three are already known, and the main object of the present investigation is to ascertain whether the hydroxyquinoline obtained in the manner just mentioned is identical with either of these three, or consists of the hitherto unknown fourth modification.

Xanthoquinic acid is for the most part resolved at 310° into carbonic anhydride and a hydroxyquinoline, which, when purified by conversion into platinochloride, etc., crystallizes from absolute alcohol in slender white prisms, soluble in alcohol without coloration, the solution however acquiring, on addition of water, a faint yellow colour, which disappears on further addition of alcohol. This behaviour distinguishes the hydroxyquinoline in question from the *meta*-modification, the alcoholic solution of which exhibits a

splendid green fluorescence. From the *ortho*-modification it is distinguished by giving, on addition of ferric chloride to its alcoholic solution, not a green, but a reddish coloration. With *para*-hydroxyquinoline, on the other hand, it agrees very nearly in its melting point (194°), and further in the yellow coloration of its alcoholic solution by ferric chloride; in giving with picric acid slender yellow prisms melting at $235\text{--}235.5^{\circ}$; with cupric acetate, first a fine blue-green colour, then gradually violet prisms, which dissolve in boiling alcohol with a fine leaf-green colour, and remain unaltered on evaporation.

This hydroxyquinoline dissolves readily when gently heated with four times its weight of strong nitric acid, and the solution, when quickly cooled and cautiously diluted with cold water, deposits orange-red crystals, easily soluble in hot water, the solution slowly mixed with potash-lye, depositing yellowish prisms, which, after re-crystallization from dilute alcohol, melt, like nitro-*p*-hydroxyquinoline, at $140\text{--}141^{\circ}$. The alcoholic solution, mixed with cupric acetate, first turns bright green, and then deposits a copper-brown precipitate, or if a trace of alkali be added, a green precipitate. The barium salt of the nitro-compound forms orange-red needles, slightly soluble in cold, much more freely in boiling water.

Cinchoninic, quininic, and xanthoquinic acids may be represented by the following constitutional formulæ :—



Compound of Quinine and Chloral. G. Mazzara. (*Gazz. Chim. Ital.*, xiii. 269. From *Journ. Chem. Soc.*) This compound, *chloral-quinine*, is formed on adding to a solution of quinine in chloroform an equivalent quantity of chloral (5.5 grams of anhydrous chloral to 10 grams of quinine). On evaporating the liquid in a dry atmosphere, a yellowish transparent gelatinous mass is left, which dissolves in cold ether; and on exposing the solution to a gentle heat, a white, mammillary crystalline substance separates, which soon pervades the whole liquid, converting it into a pulp. The same result is more quickly obtained on adding the calculated quantity of chloral to a solution of quinine in chloroform diluted with anhydrous

ether, and heating the liquid. The precipitate, after washing with ether and drying over sulphuric acid, forms an apparently amorphous, perfectly white and very light mass, having a slightly bitter taste, melting and blackening at 149° , not perceptibly altering in dry air. This body has the composition $C_{30}H_{24}N_2O_2, CCl_3.COH$. It is insoluble in benzene, sparingly soluble in cold, more soluble in hot alcohol, from which it separates on evaporation as a gelatinous mass. The solution, on addition of water, deposits a white precipitate consisting of a mixture of quinine and chloral-quinine.

Chloral-quinine dissolves in water slightly acidulated with sulphuric, acetic, or other acids, forming solutions which exhibit a fluorescence similar to that of quinine salts, and react like the latter with chlorine and potassium ferricyanide. The acetic acid solution yields with sodium bicarbonate a precipitate nearly free from chlorine. These reactions show that chloral-quinine is decomposed partially by water, completely by acids.

Phenols, as is well known, do not form addition-products with chloral, but in presence of dehydrating agents they yield condensation-products with elimination of water; phenol and thymol, for example, forming respectively dihydroxyphenyl- and dihydroxy-thymyl-trichlorethane. The author has also succeeded in obtaining addition-products by the action of chloral on paracresol and thymol, without the aid of sulphuric acid.

Paracresol-chloral, $C_6H_4Me(OH), CCl_3.COH$, crystallizes in small needles melting at $52-56^{\circ}$.

Thymol-chloral, $C_6H_4.Me(C_3H_7)(OH), CCl_3.COH$, melts at $130-134^{\circ}$.

Quinine Phenolsulphonate. P. Giurleo. (*Archiv der Pharm.* [3], xxi. 298.) This salt can be obtained by dissolving quinine in phenolsulphonic acid, and by decomposing solutions of lead or barium phenolsulphonates with a solution of quinine sulphate. The salt, which crystallizes with difficulty, contains 52 per cent. of quinine, 20 per cent. of phenolsulphonic acid, and 28 per cent. of water.

Cinchonamine. M. Arnaud. (*Comptes Rendus*, xcvi. 174; *Journ. Chem. Soc.*, 1884, 87.) Cinchonamine, $C_{19}H_{24}N_2O$, exists in *Remijia purdiana*, but is not contained in *B. pedunculata*, which contains quinine. To extract cinchonamine, the finely powdered bark is exhausted with very dilute sulphuric acid, the solution filtered, boiled, and precipitated with milk of lime. The precipitate is dried on porous tiles, and digested with boiling ether. The ethereal solution is decanted from undissolved resinous substances,

etc., washed with dilute hydrochloric acid, which removes the cinchonamine, and the acid solution of cinchonamine hydrochloride is evaporated to crystallization. The hydrochloride is dissolved in boiling dilute acid, filtered through animal charcoal, and recrystallized. The free base is obtained by adding ammonia to a solution of the hydrochloride, and crystallizing the alkaloid from boiling ether. An alcoholic solution of the alkaloid is dextrogyrate, its rotatory power at 97° being $[\alpha]_D = 122.2^\circ$. According to Dr. Laborde, cinchonamine is highly poisonous, even in very small doses.

The salts of cinchonamine generally crystallize readily, and are but slightly soluble in water, especially in presence of free acid. They dissolve in hot alcohol, from which they crystallize on cooling. The *hydrochloride* crystallizes from an acid solution in thin, brilliant, anhydrous, prismatic lamellæ, very slightly soluble in acidulated water. From a neutral aqueous solution, the salt crystallizes in opaque flattened prisms containing 1 mol. H_2O . These crystals effloresce, and are much more soluble than the anhydrous salt. This property of the hydrochloride to crystallize in an anhydrous condition from acid solutions furnishes a method of separating cinchonamine from all the alkaloids with which it is associated in *R. purdiana*. The *hydrobromide* forms brilliant, slender, anhydrous needles, slightly soluble in cold water, much more soluble in hot water. The *hydriodide* crystallizes in micaceous plates, almost insoluble in cold water. The *nitrate* is only slightly soluble in cold alcohol, but is much more soluble in hot alcohol, from which it crystallizes in hard, thick, short prisms. This salt is slightly soluble in pure water, but is insoluble in acidulated water, and is precipitated on adding nitric acid to even a dilute aqueous solution of any cinchonamine salt. The precipitate is at first flocculent, but, on standing, it rapidly becomes crystalline, the crystals being small prisms which polarise light. At 15° , 100 parts of alcohol of 94° dissolve 0.825 part of the salt; 100 parts of water at the same temperature dissolve 0.2 part of salt. The *sulphate* can be purified by crystallization from alcohol. A solution of the salt in water containing 1 mol. H_2SO_4 has a rotatory power at 15° $[\alpha]_D = +43.5$; at 25° $[\alpha]_D = +42.2$. The *formate* crystallizes with difficulty. The *acetate* is very soluble in water, from which it is deposited as a resinous mass on evaporation. By spontaneous evaporation of the aqueous solution the salt is obtained in deliquescent crystalline concretions. The *oxalate* does not crystallize from an aqueous solution, but is deposited in a resinous form. The *tartrate* forms a crystalline powder consisting of small hexagonal prisms which polarise light.

100 parts of water at 15° dissolve 1.150 parts of the salt. The *malate* forms brilliant nacreous plates, very slightly soluble in cold water, but somewhat soluble in boiling water. The crystals retain 1 mol. H_2O at 120°, but melt and become anhydrous at 160°. 100 parts of water at 15° dissolve 1 part of *malate*. The *citrate* is deposited from a boiling solution on cooling as a resinous mass, which gradually becomes crystalline, forming concretions composed of brilliant prisms which polarise light. 100 parts of water at 16° dissolve 1.950 parts of the *citrate*.

Cinchocerotin. A. Helms. (*Archiv der Pharm.* [3], xxi. 279; *Journ. Chem. Soc.*, 1884, 331.) This substance was exhibited by its producer, Kerner, at the exhibitions at Paris, in 1858, and at London, in 1862. It had been deposited in copper tubes through which hot alcohol was passed after having exhausted a mixture of calcium hydrate and South American calisaya bark. The brown mass yielded two different substances when treated with alcohol, the first and larger constituent was a white crystalline body, for which the author proposes to retain the name *cinchocerotin*, the second a light yellow substance of which only a small quantity was obtained. The first constituent is represented by the formula $C_{37}H_{48}O_2$, and melts at 180°. It is dissolved by the ordinary solvents, and when oxidized with chromic mixture, yields butyric and acetic acids, together with an acid which was obtained in crystals melting at 72°. This the author proposes to call *cinchocerotic acid*, $C_{10}H_{22}O_2$. Cinchocerotin is not attacked by alkalies, and is probably allied to betulin and cerin in constitution. The second constituent of the crude mass is decomposed at 230° without melting, and when heated with glacial acetic acid forms a crystalline acid melting at 54°, which is easily soluble in alcohol, ether, and light petroleum. It forms sparingly soluble metallic salts. A further examination of this constituent was not possible owing to the small yield.

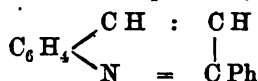
Notes on Cinchona Alkaloids. C. H. Wood and E. L. Barrett. (*Chemical News*, xlviii. 4.) In a previous paper the authors stated that the crystals obtained from an ethereal extract of cuprea bark were composed of equal quantities of quinine and quinidine. They have since then investigated this subject more closely, and publish the results, etc., in the present paper. In the first case equal quantities of quinine and quinidine sulphates were dissolved separately in acidulated water, the solution shaken with ether, excess of soda added, and the whole agitated; as soon as the precipitates had dissolved in the ether, the ethereal solutions were

decanted off and mixed. The crystals deposited from this mixed solution yielded, on analysis, numbers approximating to the composition 1 mol. quinine + 1 mol. quinidine + $2\frac{1}{2}$ H₂ O. In another experiment equal weights of the alkaloids were dissolved together in 50 per cent. spirit. The crystals obtained from this solution, after forty-eight hours' exposure over sulphuric acid, were similar in constitution to those described above. Whilst in a third experiment equal weights of the two sulphates were dissolved, etc., as in the first experiment, but the alkaloids were taken up with warm benzene. This time the crystals, even after three days' exposure, were found to contain 1 mol. quinine + 1 mol. quinidine + 2 H₂ O + C₆ H₆. From these facts the authors infer that the crystals always contain water, and therefore this compound is a hydrate of the two alkaloids.

When anhydrous, a mixture of quinine and quinidine has a lower melting point than either of the constituent alkaloids. Some of the anhydrous double body dissolved in dry benzene had deposited only a very few crystals, after remaining corked up ten days, but on removing the cork and exposing the contents of the flask to the air, plenty of crystals soon formed, and in two days the solution was half filled with them. Quinine, prepared from the sulphate, when dissolved in warm benzene, forms rhomboidal crystals of the composition 2 mols. quinine + 2 H₂ O + C₆ H₆. They lose the benzene slowly; a sample after being kept for some time had lost all odour of benzene, but gave evidence of the presence of the hydrocarbon when treated with an acid. The authors remark on the analogy these crystals bear to those of the quinine and quinidine compound when crystallized from the same menstruum. When anhydrous quinine is dissolved in dry benzene, it crystallizes out in needles containing a large quantity of benzene, which is gradually given off until only 1 mol. benzene is retained. Cinchonidine crystallizes from benzene without water, but with 1 mol. benzene, with which it readily parts. The benzene employed in these experiments was carefully purified. The authors recommended the following test for the purity of quinine:—0.7 gram of the quinine sulphate to be tested is dissolved in 20 drops of hydrochloric acid and 7 c.c. of water; 7 c.c. of benzene are added, and the whole warmed, and then shaken up with $3\frac{1}{2}$ c.c. of dilute ammonia. The benzene layer is separated, the quinine hydrate allowed to crystallize out and filtered off; the separation of feathery crystals then indicates the presence of cinchonidine. These crystals contain a large quantity of quinine. Less than 1 per cent. of cin-

chonidine can be recognised in this way. The crystals must be sought for within the liquid, not on the surface. The quantities and method of procedure given above must be strictly followed in order to ensure success. Absolutely pure benzene is not necessary for this test; the benzene should, however, crystallize when placed in a freezing mixture.

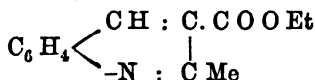
Preparation of Substituted Quinolines. P. Friedländer and C. F. Gohring. (*Journ. Chem. Soc.*, from *Ber. der deutsch. chem. Ges.*, xvi. 1833-1839.) α -Methylquinoline (quinaldine) can be prepared by the direct union of orthamidobenzaldehyde and acetone in the presence of an alkali. α -Phenylquinoline, formed on gently warming a solution of orthamidobenzaldehyde and excess of acetophenone in dilute alcohol with a few drops of soda solution, is identical with the γ -phenylquinoline of Grimaux (*Comptes Rendus*, 1883, 584) and the α -phenylquinoline of Döbner and Von Miller (*Ber.*, xvi. 1664). The formula for this compound is,—



Phenylacetaldehyde unites with orthamidobenzaldehyde, forming

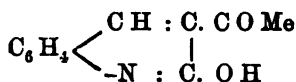
β -phenylquinoline, $\text{C}_6\text{H}_4 \begin{array}{l} \swarrow \text{CH} : \text{C Ph} \\ \searrow \text{N} : \text{CH} \end{array}$, which crystallizes in

needles melting at 93°. With an alkaline solution of ethyl acetoacetate, amidobenzaldehyde combines, producing the *ethyl salt of* α -methylquinoline β -carboxylic acid,



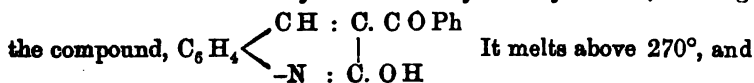
This ethereal salt is deposited from an alcoholic solution in white needles (m. p. 71°), which are insoluble in water. It forms a crystalline platinumchloride, $(\text{C}_{13}\text{H}_{13}\text{N O}_2)_2, \text{H}_2\text{Pt Cl}_6 + 2\text{H}_2\text{O}$. On saponification with alcoholic soda or hydrochloric acid, it yields α -lepidinecarboxylic acid (m.p. 234°).

If ethyl acetoacetate and amidobenzaldehyde are heated at 160° (without a solvent), *hydroxyquinolinemethylketone*,



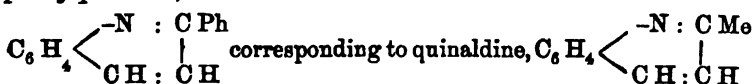
is obtained as a crystalline mass (m. p. 232°), soluble in hot water. The compound is precipitated by carbonic acid from its solution in

alkalies. Amidobenzaldehyde acts on ethyl benzoyleacetate, forming



is less soluble than the preceding substance, which it closely resembles in other respects.

Phenyl Quinoline. O. Doebner and W. v. Miller. (*Ber. der deutsch. chem. Ges.*, xvi. 1664–1667.) The formation of quinaldine from a mixture of aniline, nitrobenzene, sulphuric acid, and aldehyde, or glycol, was assumed by the authors to be due to the formation in the first case of crotonaldehyde. Experiments made with mixtures of acetaldehyde with higher homologues, e.g., butyraldehyde and valeraldehyde, show that acetaldehyde alone yields this reaction. Cinnamic aldehyde should, however, yield *phenylquinoline*,



On warming a mixture of aniline and cinnamic aldehyde, the compound $C_9H_8 : N C_6H_5$ is formed, crystallizing in yellow scales melting at 109° . It is sparingly soluble in water, readily in ether and hot alcohol. Its *hydrochloride* crystallizes in long yellow needles. *Phenyl quinoline* is prepared by heating a mixture of 30 parts of cinnamic acid, 20 parts of aniline, and 20 parts of hydrochloric acid, for two hours at 200 – 220° : the brown product is boiled with dilute hydrochloric acid, the cold filtered solution supersaturated with soda, and the phenylquinoline extracted with ether. It crystallizes from dilute alcohol in long silky needles, melting at 83° , and it boils above 300° without decomposition. It dissolves sparingly in water, readily in ether and in boiling alcohol. The *hydrochloride*, *nitrate*, and *sulphate* are readily soluble in water; the *platinochloride*, $(C_{15}H_{11}N)_2, H_2PtCl_6$, forms yellow needles, sparingly soluble in water; the *chromate*, $C_{15}H_{11}N, Cr_2O_7, H$, is a characteristic salt crystallizing in gold-coloured scales.

Preparation of Diquinoline. R. C. Tresidder. (*Chemical News*, xlviii. 31.) The author obtained diquinoline from quinoline by the following process:—

Quinoline was converted into its hydrochlorate by heating in a retort with the strongest hydrochloric acid, and distilling off the water. The hydrochlorate of quinoline was then heated with an equal weight of zinc chloride to a temperature of $350^\circ C.$ for five or six hours, the retort being inverted. The product was transferred

to a flask, and treated with strong solution of soda, added in sufficient quantity to re-dissolve the precipitate of zinc hydrate first formed. The mixture was then submitted to distillation with steam, to remove unchanged quinoline, which distilled over, leaving a black, oily liquid which solidified on cooling. This black matter was washed with water, and then boiled with a large quantity of alcohol, and the solution filtered whilst hot. The filtrate was decolorized with animal charcoal, and again filtered hot. Diquinoline crystallized out on allowing the solution to cool, and was purified by recrystallization from alcohol. The yield was not large, but sufficient to render the method applicable for the production of diquinoline.

Quinoline and Chloral. O. Rhoussopoulos. (*Ber. der deutsch. chem. Ges.*, xvi. 881.) On mixing the two liquids, the author obtained a white, insoluble butyraceous mass, which could not be recrystallized. But on mixing the ethereal solutions of the two compounds, only very little of this mass is formed, while the filtrate, on evaporation, will yield white crystals which melt at 66°C ., are decomposed by hot water, but may be recrystallized from benzol, and have the composition $\text{C}_{11}\text{H}_{10}\text{N O}_2\text{Cl}_3$, representing one molecule each of chloral, quinoline, and water.

Quinoline and Phenols. K. Hock. (*Ber. der deutsch. chem. Ges.*, xvi. 885-887.) The author observed a rather considerable rise of temperature to take place on mixing quinoline and phenol; the liquid remained transparent, but the author was unable to obtain a well-defined compound. By combining, with the aid of heat, 2 molecules of quinoline with 1 molecule of resorcin a crystalline mass of *quinoline-resorcin*, $\text{C}_{24}\text{H}_{20}\text{N}_2\text{O}_3$, is obtained, which may be recrystallized, is readily soluble in alcohol, ether, and chloroform, insoluble in benzene, sparingly soluble in cold water, and has a bitter, somewhat acrid taste. In a similar manner may *hydroquinone-quinoline* be obtained, which has similar properties, but like hydroquinone turns red, when moist, on exposure to the air. Both compounds possess antiseptic and antipyretic qualities, and are being used in the hospital of Bern.

Decomposition-Products of Coal-Tar Quinoline. E. Jacobsen and C. L. Reimer. (*Ber. der deutsch. chem. Ges.*, xvi. 1082-1087.) The authors have mentioned the formation of a yellow dye obtained by the action of phthalic anhydride on coal-tar quinoline (*Ber.*, xvi. 513), which was supposed to be identical with Traub's quino-phthalene, obtained from quinoline which had been prepared from cinchonine (*Ber.*, xvi., 878). They prepare it by heating the com-

mercial quinoline, boiling at 235–240° (2 parts), with phthalic anhydride (1 part), and zinc chloride (1 part), for four to five hours at 200°; the product is dissolved in concentrated sulphuric acid at 100°, and the solution poured into water, when the dye separates and can be purified by crystallization, first from glacial acetic acid, and then from alcohol. It forms slender, gold-coloured needles, melting at 234–235°, and subliming at higher temperatures. It is insoluble in water, very sparingly in ether, but more readily in boiling alcohol and in glacial acetic acid. It dyes silk and cotton, and resists the action of light, acids, and alkalis; it has no basic properties, water separating it unchanged from its solution in sulphuric acid. The numbers obtained on analysis agree better with the formula $C_{18}H_{11}NO_3$, than with $C_{17}H_9NO_3$, and this led the authors to the supposition that the formation of this dye might be due to the presence of methylquinoline, and that it is not derived from the quinoline itself. They prove that this is the case by showing that after the whole of the methylquinoline has been converted into the dye, the unattacked quinoline no longer gives the reaction; and also that the yellow dye is decomposed by heating with hydrochloric acid into phthalic acid and quinaldine (methylquinoline), and that it can be re-made from the latter, according to the equation $C_{10}H_9N + C_8H_4O_3 = C_{18}H_{11}NO_3 + H_2O$. Its constitution is pro-

bably $C_6H_4 \left\langle \begin{array}{c} \text{C. C O} \\ | \\ \text{N: C Me. C. C O} \end{array} \right\rangle C_6H_4$, i.e., quinaldine, in which

two hydrogen-atoms of the pyridine nucleus are replaced by the phthalic radical. Homologues of quinoline containing methyl groups in the benzene nucleus only do not react with phthalic acid, whilst homologues of quinaldine behave in the same way as the latter substance.

The red dye previously obtained by Jacobsen by the action of benzotrichloride on coal-tar quinoline can neither be obtained from pure quinoline nor from pure quinaldine, its formation being apparently dependent upon a mixture of the two.

Pyridine Bases. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xvi. 1410.) When pyridinethyl iodide is heated at the melting point of lead, a black mass is formed which, on distillation with excess of soda, yields water and an alkaline oil insoluble in water. The oil (dried over potash) has not a constant boiling point, but distils between 130° and 170°. It appears to consist of a mixture of aromatic hydrocarbons (b. p. 80–140°), pyridine and ethylpyridine.

Bases of the Pyridine and Piperidine Series. A. Ladenburg. (*Comptes Rendus*, xcvi. 516; *Journ. Chem. Soc.*, 1884, 759.) The bases of the pyridine series are tertiary bases, and they combine with alcoholic iodides, forming quaternary iodides. When these iodides are heated in sealed tubes at about 290° , they are partially converted into hydriodides of tertiary bases homologous with the pyridine employed. By this reaction two isomeric bases are always obtained: one, which is formed in largest proportion, belonging to the γ -series; whilst the other, obtained in smaller quantity, and having a higher boiling-point, probably belongs to the α -series.

When the compound of pyridine with ethyl iodide is treated in this way, it yields two lutidines, one of which boils between 153° and 154° , and yields isonicotianic acid on oxidation, whilst the other boils at about 166° , and on oxidation yields traces only of an acid which has not yet been isolated. The compound with propyl iodide yields two collidines, one of which, γ -propyl-pyridine, boils at 163° , and yields isonicotianic acid on oxidation; whilst the other boils at 174° , and is characterized by its slightly soluble and distinctly crystalline platinochloride. The compound with methyl iodide seems to behave in a precisely similar manner, but the products have not yet been isolated. If these quaternary iodides are heated at a still higher temperature, ammonia and a considerable proportion of aromatic hydrocarbons are formed. Ethylbenzene was obtained in this way from the compound with ethyl iodide.

The conversion of pyridine bases into piperidine bases is effected by the action of sodium on a hot alcoholic solution, practically the theoretical yield being obtained, and in this way a whole series of homologues of piperidine can be prepared. Pyridine yields a piperidine which seems to be identical with the piperidine obtained from piperine. Crude methyl-pyridine from Dippel's oil, however, yields a methyl-pyridine entirely different from that described by Hofmann. It is a transparent, strongly alkaline liquid, which boils at 122° , and has the odour of piperidine. It dissolves in water with development of heat, but separates from a very strong solution on heating. It yields a crystalline and non-deliquescent hydrochloride, a very soluble crystalline platinochloride, and a much less soluble aurochloride, which melts in slightly warm water. The crude methyl-pyridine from which this base was obtained contained β -methyl-pyridine, together with a larger proportion of α -picoline.

γ -Ethylpiperidine is obtained in the same way from the γ -ethylpyridine prepared by the method described above. It boils at 143° , forms a crystalline hydrochloride, has an odour resembling that of

conicine, and behaves like this latter compound in contact with water.

Kairine and Kairoline: Hydroxyquinolinemethyl Hydride and Quinolinemethyl Hydride. M. Filehne. (*Pharm. Journ.*, 3rd series, xiv. 383.) The present paper treats of the physiological properties of these bodies. They are both, as well as some other compounds of the quinoline series, very powerful anti-pyretics, but have no local action, and are therefore valuable medicines in cases of fever. They are quite similar in action; kairoline is, however, less energetic, and slower in action than kairine. Kairine has been tried in a series of acute and chronic febrile diseases, and in all, its antithermic action was found to be constant.

The hydrochloride is the salt employed; it is a clear crystalline greyish yellow powder, very soluble in water, and has a bitter somewhat aromatic taste. After administering the powder, water should be drunk freely. Its use is not accompanied by any unpleasant effects such as headache, ringing in the ears, sickness, etc. With regard to its antithermic properties, doses of 1 to 1.5 gram in healthy adults have no physiological action and no effect on the temperature; whilst in cases of adult patients or debilitated subjects, a dose of 1 gram every two hours must not be exceeded, otherwise cyanosis is apt to ensue. The most suitable dose in adult fever cases is 0.3 to 0.5 gram every hour or half hour. The interval between one gram doses should not exceed two and a half hours, and that between 0.5 gram doses not more than one and a half to two hours, for the effect of 1 gram only lasts three hours, whilst that of 0.5 gram is of two and a quarter hours duration; to produce a less pronounced effect the dose should be reduced without increasing the interval. When the influence of the drug ceases, the temperature rises again, with a feeling of chilliness amounting sometimes to actual rigour. Less than 0.3 gram given at once has no practical effect on the temperature; a dose of 0.3 to 1 gram lowers the temperature by $\frac{1}{2}$ to 2°; another dose given before the effect of the former one passes away, causes a further reduction; and if 0.5 gram be given hourly, it invariably follows that, without any injurious effect, the temperature falls to the normal point or below it, after the fourth (sometimes after the third, or even the second) dose. The temperature cannot be brought below 37–36.5° C., and the low temperature is maintained only as long as the administration of the drug is continued every two and a half hours at least, otherwise shivering occurs, and the temperature rises to the point corresponding to the acuteness of the disease; this drawback is overcome, so

as not to disturb the night's rest, by judicious dosing during the day, and by giving a full dose of 2 grams of *kairoline* the last thing at night. The action of kairine begins twenty-five minutes after the dose of 0.5 to 1 gram is taken by the mouth; the fall in temperature is more rapid the larger the dose, and is always accompanied by profuse sweating, which lasts only as long as the temperature continues to fall. During the use of these drugs, the urine becomes green, but contains no sugar or albumen. Pneumonia patients especially have enjoyed great comfort from the use of this drug; in fact, such cases can be kept quite free of fever. It is suggested to use kairine as a remedy in malarial affections, by giving 1 gram hourly, three hours before the expected attacks.

Action of Nascent Hydrogen on Pyrroline. G. L. Ciamician and M. Dennstedt. (*Ber. der deutsch. chem. Ges.*, xvi. 1536-1544; *Journ. Chem. Soc.*, 1883, 1142.) The pyrroline is heated with zinc-dust and acetic acid for twenty-four hours, and the product distilled on a water-bath under diminished pressure to expel the acetic acid and the unaltered pyrroline; on treating the residue with water, a green solution is obtained, leaving an insoluble residue of zinc-dust mixed with a resinous substance insoluble in alcohol. The solution is freed from zinc by means of sulphuretted hydrogen, acidulated with hydrochloric acid, evaporated, and the residue steam-distilled with an excess of potash, when a quantity of ammonia is given off. The distillate is acidulated with hydrochloric acid, evaporated, and the residue dissolved in a small quantity of water, and again distilled with potash. The purified oil boils at 90-91°, it is extremely soluble in water, and absorbs carbonic anhydride from the air, forming a solid deliquescent compound. It forms a *hydrochloride*, C_4H_7N, HCl , melting at 173-174°, readily soluble in boiling alcohol, from which it crystallizes in prisms. From the formula of the hydrochloride, it is evident that the free *hydropyrroline* has the formula C_4H_7N . The *platinochloride*, $(C_4H_7N)_2, H_2PtCl_6$, is sparingly soluble in cold water, readily in boiling water, it crystallizes in the triclinic system. Methyl iodide acts very violently on hydropyrroline, with formation of the compound C_4H_5MeN, MeI ; this crystallizes from boiling alcohol in nacreous scales, melting at 286° with decomposition; it dissolves very readily in water, and its solution is not decomposed by potash. By the action of freshly precipitated silver chloride, the corresponding *chloride* is obtained. The *platinochloride*, $(C_4H_{12}N)_2, H_2PtCl_6$, crystallizes in orange-coloured needles, with variable amounts of water. By the action of silver oxide on a solution of the methiodide, a strongly alkaline

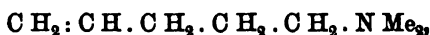
liquid is obtained, which can be evaporated nearly to dryness without decomposition; on distilling the residue it decomposes, yielding a nearly colourless distillate, sparingly soluble in water, and having a penetrating odour resembling that of the isonitriles.

Nitrosohydropyrroline, $C_4H_6N.NO$, can be prepared by the action of potassium nitrite on a solution of the base in dilute sulphuric acid. It crystallizes from light petroleum in needles, melting at $37-38^\circ$; it dissolves very readily in water, alcohol, and ether, and gives the characteristic nitrosamine reaction with phenol and sulphuric acid. The reactions with methyl iodide and nitrous acid show that hydropyrroline is a secondary base of the formula $C_4H_6:NH$.

Action of Methyl Alcohol on Piperidine Hydrochloride. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xvi. 2057-2059.) If piperidine hydrochloride is heated at 200° with methyl alcohol, the hydrochlorides of methyl- and dimethyl-piperidine are formed, together with methyl ether. These changes may be represented by the following equations:—

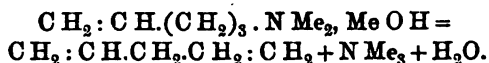
- (1) $2 Me OH + C_5H_{11}N, HCl = Me_2O + C_5H_{11}N, HCl + H_2O$;
- (2) $Me OH + C_5H_{11}N, HCl = C_5H_{10}N Me, HCl + H_2O$; and
- (3) $2 Me OH + C_5H_{11}N, HCl = C_5H_9N Me_2, HCl + 2 H_2O$.

The author offers some remarks on the constitution of the piperidine derivatives. Dimethylpiperidine hydrochloride, $C_5H_9N Me_2, HCl$, which behaves generally as a substituted ammonium chloride, forms methylpiperidine when distilled, but dimethylpiperidine if heated with potash. Hofmann explains this change by supposing a transformation of a methyl-group from a nitrogen- to a carbon-atom, similar to that which takes place in the conversion of methylaniline into toluidine. The author objects to this explanation, and points out that dimethylpiperidine by the action of hydrochloric acid is converted into methyl chloride and methylpiperidine; a change which is without parallel in the benzene derivatives. The author puts forward another view, viz., that in the formation of dimethylpiperidine an affinity between the carbon- and nitrogen- atoms is broken up, and then the second methyl group attaches itself to the nitrogen-atom. Dimethylpiperidine will then have the constitution—



and on treatment with hydrochloric acid will yield a base isomeric with piperidine, $CH_2:CH.CH_2.CH_2.CH_2.N Me H$, which is

converted into methylpiperidine. Several other observations agree with this explanation; first the formation of trimethylamine and not trimethylpiperidine, by the action of methyl iodide on dimethylpiperidine; secondly, the fact that piperylene takes up four and not two atoms of bromine; thirdly, the decomposition of the base obtained from dimethylpiperidine by the action of methyl iodide and silver oxide into piperylene and trimethylamine, thus:—



Synthesis of Piperidine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xvii. 156.) Pyridine cannot be converted into piperidine by the action of tin and hydrochloric acid, but by the action of sodium on an alcoholic solution of pyridine the hydrogenisation can be effected, although only in small part. The separation of the bases was effected by nitrous acid, the resulting nitrosopiperidine being afterwards decomposed by hydrochloric acid. The platinochloride prepared from the base showed a complete agreement in properties with those of piperidine platinochloride.

Studies on Morphine. O. Hesse. (*Annalen der Chemie*, ccxxii, part 2.) The author has investigated the behaviour of morphine with acetic anhydride, propionic anhydride, and methyl iodide; the behaviour of the morphine-methyl compounds with acetic anhydride; the action of methyl iodide upon morphine in presence of bases; the behaviour of methyl morphine (codeine) with acetic and propionic anhydride; the action of methyl iodide upon methyl-morphine; the behaviour of methyl-morphine-methyl-chloride with acetic anhydride; the reaction of the corresponding iodide with bases, and of the hydroxide concerned with water; the behaviour of methyl-morphimetine with acetic anhydride and methyl iodide; the action of acetic anhydride upon the α -chloride; the behaviour of the α -iodide with alkali, and the reaction of the β -chloride with acetic anhydride. The author concludes from the results obtained that morphine contains only two atoms of hydrogen, capable of being substituted by radicals of the fatty series. One of the hydroxyles in morphine is more resistant than the other.

Papaverine. G. Goldschmidt. (*Monatsh. Chem.*, iv. 704–707.) The oxidation of papaverine with potassium permanganate yields nothing but uncrystallizable products. On boiling this base with a somewhat dilute solution of potassium permanganate, ammonia is given off, and an uncrystallizable acid is formed which decomposes carbonates and forms amorphous salts.

Papaverine fused with potassium hydroxide yields protocathechuic acid and an alkaline distillate containing papaverine, methylamine, and dimethylhomocatechol, boiling at 218° and convertible by oxidation into protocathechudimethyletheric acid. The same two volatile products, dimethylhomocatechol and methylamine are formed in the dry distillation of papaverine, and apparently also in the distillation of that base with lime or zinc-dust.

Baryta water acts very slowly on papaverine, with evolution of ammoniacal vapours, and formation of a very small quantity of a greasy substance smelling like guaiacol. Sodium-amalgam slowly converts papaverine in alcoholic solution into a thick oil, which deposits crystals after long standing. With acetic anhydride and sodium acetate, papaverine does not yield an acetyl-derivative, whence it may be inferred that this base does not contain an acetyl-group.

Papaverine, heated with hydrochloric acid in a sealed tube at 130° , yields a gas which burns with a green flame (probably methyl-chloride) and a solution, the evaporated residue of which forms a thick brown oil, which, in dilute aqueous or alcoholic solution, gives with ferric chloride a deep emerald-green coloration, changed by sodium carbonate to red—a reaction probably due to homocatechol. With potash-lye, the oil forms a dark-brown liquid. Sodium carbonate added to the aqueous solution of the oil, throws down a white flocculent precipitate which soon resinizes after filtration, and turns green in contact with the air. These reactions point to the presence of apomorphine.

Oxidation of Morphine. L. Barth and H. Weidel. (*Monatsh. für Chem.*, iv. 700.) The action of most oxidizing agents on morphine does not yield very definite results; potassium permanganate, however, in slightly alkaline solution acts on it somewhat more energetically, yielding as chief product a light brownish uncrystallizable acid syrup, which forms amorphous salts, and when mixed with cupric acetate, remains clear at first, but becomes turbid on boiling, depositing a blue-green flocculent precipitate, which redissolves on cooling. This result is like that which is obtained by similar treatment of cinchomeric and pyridine-tricarboxylic acids. Morphine subjected to dry distillation with lime, yields a basic oil having a decided odour of pyridine. Arsenic acid acts but slowly on morphine, even in sealed tubes, yielding a base which appears to contain one methyl-group less and one hydroxyl-group less than morphine; the action is however variable, and so are the products. When morphine is heated with

potassium hydrate till the surface of the melt begins to glow, and the product, after cooling, is acidulated, brown-black non-nitrogenous flocks are deposited, and a solution is obtained from which ether extracts a considerable quantity of substance; and on expelling the ether, digesting the residue with water, precipitating the filtrate with lead acetate, decomposing the precipitate with sulphuretted hydrogen, evaporating, and repeatedly crystallizing the residue, a product is obtained consisting of protocatechuic acid. The filtrate freed from lead and evaporated yields more protocatechuic acid, together with another acid which crystallizes in prisms, and gives no colour-reaction with iron salts.

When the melting with potash was conducted in a silver retort, and the vapours were received in dilute hydrochloric acid, methylamine was obtained, together with a small quantity of another base.

The absence of aromatic compounds amongst the products formed by oxidizing morphine with permanganate, and the non-occurrence of derivatives of pyridine (or quinoline) in the oxidation of this alkaloid with caustic alkali, seems to show that the mode of combination of the aromatic and of the pyridine- (or quinoline-) groups in it, is different from that which exists in narcotine, which, it is well known, is easily resolved into its two principal constituents.

The Salts of Narcotine. D. B. Dott. (*Pharm. Journ.*, 3rd series, xiv. 581.)

Meconate.—When narcotine and meconic acid are dissolved together in water, in molecular proportions, *i.e.*, two molecules of the base to one of the acid (which is di-basic), a syrupy solution is obtained which refuses to yield crystals. If evaporated, the salt dries as a varnish. Unlike most amorphous salts, this is not readily taken up by water. When the proportions for the acid meconate are used, a clear viscous solution is obtained. This ultimately becomes filled with crystals; but the author has not yet ascertained whether they are really a crystalline acid salt, or only the neutral salt with separated acid. "The books" give no information about these meconates.

Acetate.—This is one of the only two crystalline salts mentioned by the older authorities. According to Berzelius, it is prepared by "dissolving narcotine in concentrated acetic acid, and evaporating *in vacuo* in presence of lime." The author prepared a quantity of acetate according to these directions (leaving out the lime). Narcotine will not dissolve in an equivalent of glacial acid; indeed, a clear solution was only obtained by warming with several times that amount. On cooling, the solution before long became filled

with crystals, which were strongly pressed, first in calico and then between blotting paper. The crystals were immediately bottled, and two portions weighed off as quickly as possible. One of these was mixed with ten times its weight of calcium hydrate, and exposed in the water-bath, while in the other the narcotine was determined by precipitation with ammonia.

23.04 grs. lost in w. b. 0.36 gr. = 1.56 per cent.

26.45 grs. treated with cold water left undissolved 24.28 grs.

By NH_3 0.66 gr. was obtained in addition, making the total narcotine = 94.29 per cent.

	Calculated.	Found.
$(\text{C}_{22}\text{H}_{23}\text{NO}_7)_3 \cdot \text{C}_2\text{H}_4\text{O}_3 \cdot \text{H}_2\text{O}$	94.07	94.29
H_2O	1.86	1.56

Whence it is probable that the salt obtained as just described has the above composition. In any case, it is of no value, on account of its insolubility in water, or (what amounts practically to the same thing) its immediate decomposition by water.

Hydrochloride.—The dry salt was correctly described by Regnault and Robiquet, but they made no mention of water of crystallization. Dr. Wright was the first who fully investigated this salt, and the author's analysis leads to the same conclusion, that the normal hydrochloride has the composition $\text{C}_{22}\text{H}_{23}\text{N O}_7 \cdot \text{H Cl} \cdot \text{H}_2\text{O}$. Strong solutions of this salt show a curious tendency to gelatinize, like the salts of cryptopine. The muriate of narcotine may be regarded as its most important salt, being easily prepared and fully soluble.

Sulphate.—The author has not been able to find any published reference to this salt, which is readily obtained by dissolving narcotine with the theoretical proportion of sulphuric acid and allowing to crystallize. Some of these crystals were dried by exposure to the air, and a weighed quantity of the air-dry salt placed in the water-bath. 14.55 grs. lost 0.10 gr. = 0.68 per cent.

Two portions of the same salt were dissolved in water, an excess of ammonia added, and the precipitates collected and weighed.

17.200 grs. gave 14.30 grs. = 83.13 per cent.

6.555 grs. gave 5.45 grs. = 83.14 per cent.

14.55 grs. dried at 130°C . gave only 78.35 per cent., indicating decomposition at that temperature.

The salt dried in the water-bath lost weight further in the air-bath at 120° . 9.74 grs. lost 0.675 gr. = loss in weight of 6.98 per cent. on the air-dry salt.

From the results obtained it was suspected that the sulphate used

in these experiments had been over dried by too long exposure to the air. A quantity of it was therefore moistened with water, and when apparently just dry was transferred to the water-bath.

9.740 grs. lost 0.145 gr. = 1.48 per cent.

It would, therefore, appear that narcotine sulphate has the composition $(C_{22}H_{23}NO_7)_2 \cdot H_2SO_4 \cdot 4H_2O$, and that it loses one molecule of its water below $100^\circ C.$, the remainder at a higher temperature.

		Calculated.	Found.
$+ N_2H_2SO_4 \cdot 4H_2O$	H_2O	. 7.22	. 6.93
$+ N_2H_2SO_4 \cdot 3H_2O \cdot H_2O$	H_2O	. 1.71	. 1.48
" "	$+ N$	. 82.93	. 83.13

The meconate, muriate, and sulphate, dissolve completely in water, and their solutions remain clear even when largely diluted. Not so the acetate. By adding hot water to a solution of narcotine in dilute acetic acid, the greater part of the alkaloid is precipitated. The solutions of all salts of narcotine are *acid*, i.e., they behave as if they contained free acid. Water seems to cause a slight decomposition in the sulphate and hydrochloride, and an almost complete one in the acetate.

Codeine Hydrobromide. D. B. Dott. (*Pharm. Journ.*, 3rd series, xiv. 917.) Codeine hydrobromide crystallizes from an aqueous solution in radiate tufts of four-sided prisms. The solubility in water was determined by digestion at a temperature below $60^\circ F.$ for twenty-four hours, then at 60° for two hours, when portions of the solution were weighed and evaporated to dryness on a water-bath.

(a) 165 grs. solution left 1.93 grs. = 1.97 grs. 2—hydrate.

$$\frac{165 - 1.97}{1.97} = 82.75.$$

(b) 144.25 grs. left 1.70 = 1.73 grs. 2—hydrate.

$$\frac{144.25 - 1.73}{1.73} = 82.38.$$

The solubility in water at $60^\circ F.$ is, therefore, approximately 1 in 82.5.

With the heat of a water-bath 8.04 grs. of the air-dry salt lost 0.17 gr. = 2.11 per cent. $C_{18}H_{21}NO_3 \cdot HBr \cdot 2H_2O = 2.16$ per cent. for $\frac{1}{2}H_2O$. In the air-bath at $115^\circ C.$ 5.74 grs. lost 0.485 gr. = 8.44 per cent. $C_{18}H_{21}NO_3 \cdot HBr \cdot 2H_2O = 8.65$ per cent. for $2H_2O$.

It is, therefore, evident that the hydrobromide, like the hydrochloride, loses a fourth part of its combined water at the temperature of the water-bath, and the remainder at some temperature above 100° . To avoid fractions of molecules, the formula should be written $(C_{18}H_{21}N_4O_3 \cdot HBr)_2, 4H_2O$, or more accurately (having in view the researches of Dr. Wright), $C_{36}H_{42}N_8O_6 \cdot 2HBr \cdot 4H_2O$.

Caffeine and its Salts. H. Biedermann. (*Archiv der Pharm.* [3], xxi., 175–186. From *Journ. Chem. Soc.*) The author has examined caffeine and its principal salts, as the existence of many of these has recently been denied by several authors. Caffeine, $C_8H_{10}N_4O_2 \cdot H_2O$, melts at 230.5° ; the aurochloride of caffeine has the formula $C_8H_{10}N_4O_2 \cdot HCl, AuCl_3 + 2H_2O$, and the platinumchloride the formula $(C_8H_{10}N_4O_2)_2 \cdot H_2PtCl_6$. Caffeine hydrochloride, $C_8H_{10}N_4O_2 \cdot HCl + 2H_2O$; hydrobromide, $C_8H_{10}N_4O_2 \cdot HBr + 2H_2O$; nitrate, $C_8H_{10}N_4O_2 \cdot HNO_3 + H_2O$; sulphate, $C_8H_{10}N_4O_2 \cdot H_2SO_4$; formate, $C_8H_{10}N_4O_2 \cdot H_2CO_2$; acetate, $C_8H_{10}N_4O_2 \cdot 2AcHO$; butyrate, $C_8H_{10}N_4O_2 \cdot C_4H_8O_2$; and valerate, $C_8H_{10}N_4O_2 \cdot C_5H_{10}O_2$, were all obtained in the crystalline state by dissolving caffeine in the appropriate acid, and evaporating the solution over potash. All these salts are unstable, and cannot be crystallized from alcohol or water; at 100° they are either wholly or partially decomposed. Anhydrous chlorides having the formula $C_8H_{10}N_4O_2, 4HCl$, and $C_8H_{10}N_4O_2, HCl$, were obtained by the action of dry hydrochloric acid gas on caffeine. A normal sulphate was also obtained which crystallized with 1 mol. H_2O . When caffeine is dissolved in a strong solution of hydriodic acid, and the solution evaporated over potash, the normal hydriodide is not alone obtained, but a periodide, $(C_8H_{10}N_4O_2, HI, I_2)_3 + 3H_2O$, and also a mixture of the normal hydriodide, $C_8H_{10}N_4O_2, HI$, and the hydriodide, $C_8H_{10}N_4O_2, 2HI$.

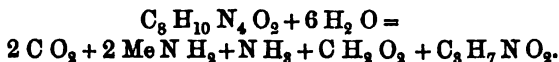
Occurrence of Caffeine in Cocoa. E. Schmidt. (*Liebig's Annalen*, ccxvii. 306–308.) The mother-liquors left in the preparation of theobromine from cocoa yielded a few needle-shaped crystals, which the author found to be identical in all respects with caffeine. For the purposes of estimation he recommends cold benzol for the separation of the two bases.

Caffeine Methhydroxide. E. Schmidt. (*Ber. der deutsch. chem. Ges.*, xvi. 2587; *Journ. Chem. Soc.*, 1884, 338.) In the hope of obtaining an insight into the constitution of caffeine, the author submitted caffeine methhydroxide to the action of hydrochloric acid. He previously showed that caffeine and the theobromine yield the same decomposition-products when treated in this way;

but the reaction threw no light on the constitution of these substances. Caffeine methhydroxide, $C_8H_{10}N_4O_3$, $MeOH + H_2O$, is readily obtained by the action of moist silver oxide or caffeine methiodide. When it is dissolved in fuming hydrochloric acid, and left for from fourteen to twenty days to evaporate spontaneously, amalic acid separates, with simultaneous formation of methylamine and formic acid, the production of amalic acid being, however, due to a secondary decomposition of the dimethyldialuric acid first formed. A considerable portion of the caffeine methhydroxide is also converted into caffeine methylchloride, $C_8H_{10}N_4O_3, MeCl$; whilst a smaller portion gives rise to secondary reactions.

Caffeine methhydroxide suffers no appreciable change on continued heating above its melting point ($137-139^\circ$), but is completely decomposed when submitted to dry distillation in a current of hydrogen, caffeine being produced. Water decomposes it at about 200° , with formation of carbonic anhydride and methylamine. With a solution of bromine in chloroform it yields a readily decomposable addition-compound, which is decomposed by water into hydrobromic acid, methylamine, cholestrophane, and allocaffeine. This last substance is probably methylapocaffeine, since it is decomposed into carbonic anhydride and methylcaffuric acid when boiled with water. By the action of hydrochloric acid and potassium chlorate, caffeine methhydroxide yields dimethylalloxan, allocaffeine, amalic acid, cholestrophane, and methylamine; with chromic mixture it yields carbonic anhydride, formic acid, cholestrophane, and methylamine. Nitric acid (sp. gr. 1.4) decomposes it at ordinary temperatures, with violent evolution of carbonic anhydride and formation of methylamine and cholestrophane. Baryta-water also decomposes it in the cold.

Action of Hydrochloric Acid on Caffeine. E. Schmidt. (*Liebig's Annalen*, ccxvii. 270-287.) It was thought possible that theobromine might be formed by this reaction with elimination of a methyl group. No reaction, however, takes place below about 240° , the caffeine then decomposing, with formation of carbonic anhydride, ammonium chloride, methylamine hydrochloride, sarcosine hydrochloride, and traces of formic acid,



The reaction is effected in sealed tubes, the temperature being maintained at $240-250^\circ$ for from six to twelve hours; above 260° the product becomes partially carbonised. The caffeine employed was

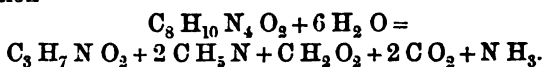
the pure product obtained from tea. The methylamine hydrochloride is separated and purified by means of its platinochloride, which crystallizes partly in lustrous yellow plates and partly in orange-red rosette-like groups. The sarcosine was identified by means of its copper salt, $(C_8 H_8 N O_3)_2 Cu, 2 H_2 O$; sarcosine obtained by the action of barium hydroxide on caffeine yielding a perfectly similar salt. These results show that caffeine yields the same products by the action either of hydrochloric acid or of barium hydroxide, except that in the former case the intermediate product, cafeedine is not produced. Theobromine is decomposed by hydrochloric acid, with formation of the same products as in the case of caffeine; but the proportion of ammonia to methylamine is in this case two molecules of the former to one of the latter, showing that the additional methyl-group in the caffeine must be united with a nitrogen-atom. The fact that only one of the four nitrogen-atoms in caffeine can be eliminated as ammonia is in accordance with the formula given by Fischer (*Annalen*, ccxv. 314) and Medicus, but is not explained by Strecker's formula.

The author has also very carefully compared artificial caffeine, as prepared by Strecker, with natural caffeine obtained from tea. His results confirm those previously obtained by Strecker, a comparison of the following salts proving that artificial and natural caffeine are identical. The *hydrochloride*, $C_8 H_{10} N_4 O_2, H Cl, 2 H_2 O$, forms colourless monoclinic crystals, which give off hydrochloric acid and water by exposure to air, leaving pure caffeine; the same change taking place rapidly at 100° , or by the action of water or alcohol. The *platinochloride*, $(C_8 H_{10} N_4 O_2)_2, H_2 Pt Cl_6$, crystallizes in small rosette-like groups of needles, and contains variable amounts of water. *Caffeine aurochloride*, $C_8 H_{10} N_4 O_2, H Au Cl_4, 2 H_2 O$, forms lustrous gold-coloured plates. *Caffeine methiodide*, $C_8 H_{10} N_4 O_2, Me I, H_2 O$, is formed when caffeine is heated for some hours at 130° with an excess of methyl iodide in sealed tubes, and may be purified by washing with cold alcohol and crystallizing from water, in which it is moderately soluble, although but sparingly so in alcohol, and almost insoluble in ether.

Caffeine and Theobromine. R. Maly and R. Andreasch. (*Monatsh. Chem.*, iv. 369-387; *Journ. Chem. Soc.*, 1883, 1016.)

Action of Dilute Alkalies on Caffeine.—The bodies hitherto obtained by the action of alkalies on caffeine are products of decomposition due to secondary actions; thus Wurtz, by distilling caffeine with potash, obtained methylamine, and Rochleder obtained the same base by treating caffeine with chlorine. Strecker, by heating

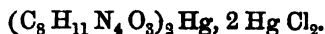
caffeine with baryta-water, obtained a new base, caffeidine, $C_7H_{12}N_4O$, formed according to the equation $C_8H_{10}N_4O_2 + H_2O = CO_2 + C_7H_{12}N_4O$. Secondary actions however take place at the same time, giving rise to methylamine, formic acid, and sarcosine, $C_3H_7NO_2$, the formation of these products being represented by the equation—



The process, as usually conducted, yields only a small quantity of caffeidine; but the authors of the present paper find that by moderating the action of the alkali, and especially by keeping down the temperature, the formation of secondary products may to a great extent be avoided. Moreover, they find that caffeidine itself is only a secondary product, and that caffeine, when subjected to the gentle action of alkalies, simply takes up 1 mol. water, and is converted into an acid, $C_8H_{13}N_4O_3$, which is resolved by boiling with water into carbonic anhydride and caffeidine, ($C_8H_{13}N_4O_3 = CO_2 + C_7H_{13}N_4O$), and may therefore be called caffeidine-carboxylic acid.

This acid is easily prepared by digesting finely divided caffeine at 30° in a dilute solution of potash and soda, neutralising with acetic acid, adding a solution of cupric acetate, and decomposing the copper salt thereby precipitated with sulphuretted hydrogen; it may be purified by solution in chloroform and precipitation with benzene, and is thus obtained in the form of a thick oil, which on exposure to the air solidifies to a yellowish white, slightly crystalline mass, very easily soluble in water. On boiling its aqueous solution, carbonic anhydride is evolved, and there remains a reddish oil, which, when stirred up with a small quantity of sulphuric acid and treated with alcohol, solidifies to a white acicular mass of caffeidine sulphate. This reaction forms an easy way of preparing caffeidine: it is merely necessary to decompose the copper salt with sulphuretted hydrogen, evaporate the filtrate quickly, and treat it with strong sulphuric acid.

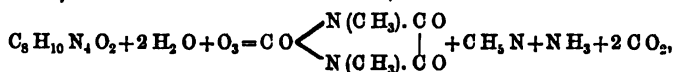
A solution of mercuric chloride affords a delicate test for caffeidine-carboxylic acid, forming with its soluble salts a copious white precipitate, which is not a simple mercuric salt, but also contains chlorine, and appears to have the composition—



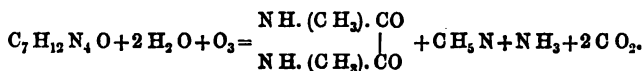
When decomposed by sulphuretted hydrogen, it yields a filtrate, which on evaporation leaves caffeidine hydrochloride.

Action of Alkalies on Theobromine.—The behaviour of this compound to bases is totally unlike that of caffeine; in fact it reacts with alkalies and alkaline earths like an acid, forming definite salts. The *sodium salt*, obtained by adding theobromine to soda-lye in such quantity that a portion remains undissolved after long standing, and evaporating the filtrate under the air-pump, forms milk-white crusts and rings destitute of crystalline structure. It is extremely soluble in water; has a strong alkaline reaction; absorbs carbonic anhydride from the air, and is decomposed thereby. Its aqueous solution forms precipitates with silver nitrate, lead acetate, and zinc chloride, and after a while with mercuric chloride. The *barium salt*, $(C_7H_7N_4O_2)_2Ba$, separates, on adding theobromine to baryta-water, as a mass of microscopic needles, and on dissolving this in hot water, filtering, and leaving the filtrate to cool slowly, the compound is obtained in somewhat larger needles; forming a snow-white loosely coherent mass having a somewhat silky lustre. It is but sparingly soluble in cold water, has an alkaline reaction, and the solution when quickly cooled solidifies to a stiff jelly, like gelatinous silica. When heated it melts to a liquid which solidifies by slow cooling to the above-mentioned mass of needles, and by rapid cooling to the jelly, which latter however gradually passes into the former. On pouring a little of the hot solution upon a cold surface, it solidifies, and may be pulled off like a membrane.

Oxidation of Caffeidine with Chromic Acid.—The authors have previously shown that caffeine is converted by oxidation with chromic acid mixture into cholestrophane, according to the equation,—



and they now find that caffeine is converted in like manner into dimethyloxamide,—



Behaviour of Caffeine in the Animal Organism.—From experiments in which caffeine was mixed with the food of a dog, the authors infer, in accordance with the results obtained by other experimenters, that the greater part, if not the whole, of the caffeine passes unchanged through the organism, and may be recovered in the urine.

Theobromine. E. Schmidt and H. Pressler. (*Journ. Chem. Soc.*, 1883, 872, from *Liebig's Annalen*, ccxvii. 287–306.) To

prepare theobromine, the authors mix cacao which has been freed from oil by pressure, with half its weight of calcium hydroxide, and boil repeatedly with 80 per cent. alcohol. After recrystallizing the residue obtained from the evaporation of the alcohol, the theobromine forms a white crystalline powder. It is anhydrous, and sublimes at about 290° without melting. Its salts are obtained by dissolving the base in concentrated acids, and resemble those of caffeine in their instability, being decomposed by contact with water or alcohol. The *hydrobromide*, $C_7H_8N_4O_2 \cdot HBr + H_2O$, forms colourless transparent platy crystals, which lose their water at 100° , together with a part of the hydrobromic acid. The *hydrochloride*, $C_7H_8N_4O_2 \cdot HCl + H_2O$, crystallizes in colourless rosette-like groups of needles, which lose both water and hydrochloric acid at 100° . The *platinochloride*, $(C_7H_8N_4O_2)_3 \cdot H_2PtCl_6 + 4H_2O$, has been described by Glasson. According to the authors, it sometimes contains $4H_2O$, and sometimes $5H_2O$. The *aurochloride*, $C_7H_8N_4O_2 \cdot HAuCl_4$, forms yellow tufts of needles. The *sulphate* has been obtained in small colourless crystals, but of varying composition. The *nitrate*, $C_7H_8N_4O_2 \cdot HNO_3$, has been described by Glasson. The *acetate*, $C_7H_8N_4O_2 \cdot C_2H_3O_2$, forms a white voluminous precipitate, which gradually loses its acid by exposure to the air. In its behaviour to methyl iodide, theobromine differs markedly from caffeine, for on heating the mixture either alone or in solution, in alcohol or in chloroform, no combination of the theobromine with the methyl iodide takes place; whilst if a mixture of theobromine, alcoholic solution of potash, and methyl iodide, in equivalent quantities, is heated at 100° in sealed tubes, caffeine is produced identical with the natural base: $C_7H_8N_4O_2 + KOH + MeI = C_7H_7MeN_4O_2 + KI + H_2O$. On heating theobromine with hydrochloric acid at $240-250^{\circ}$, it suffers decomposition similar to that of caffeine, yielding ammonia, methylamine, sarcosine, carbonic anhydride, and formic acid. The same products are also formed on boiling theobromine with solution of barium hydroxide, and attempts to obtain an intermediate product, *theobromidine* (corresponding with caffeidine), have as yet been unsuccessful. The bromine-derivative, $C_7H_7BrN_4O_2$, obtained by the direct action of bromine, agrees with the compound described by Fischer. When theobromine is boiled with five parts of concentrated nitric acid in an upright retort until the greater part of the liquid has been volatilised, and the residue then evaporated on a water-bath, amalic acid is obtained. On boiling the latter with concentrated nitric acid, a further decomposition takes place, with evolution of carbonic anhydride and

formation of methylparabanic acid and methylamine. Maly and Hinteregger have shown that, besides these products, ammonia is also produced when the oxidation is effected by means of chromic mixture. Caffeine is decomposed by nitric acid in the same way as theobromine, dimethylparabanic acid, methylamine, and carbonic anhydride being formed, but in this case no ammonia.

Xanthine and Hypoxanthine. A. Kossel. (*Zeitschr. für Physiol. Chem.*, vi. 422-431.) The author has already in previous papers shown that xanthine and hypoxanthine are formed by the action of dilute acids and water at 100° on nucleins, a group of bodies whose representatives are found everywhere in the active cells of plants and animals, and which may therefore be regarded as necessary constituents of the developmentally active living tissue. It was therefore concluded that these products of decomposition of nucleins have a more universal distribution, and that in the organs which are known to be the place of their formation, they are produced in larger amount than has hitherto been assumed. The present paper, relating to some researches in regard to xanthine, is in supplement to former communications upon the investigation and quantitative determination of hypoxanthine in a series of animal and vegetable structures.

Action of Hydrochloric Acid on Xanthine. E. Schmidt. (*Liebigs Annalen*, ccxvii. 308-312.) Xanthine, like caffeine and theobromine, yields ammonia, glycosine, carbonic anhydride, and formic acid, on decomposition with hydrochloric acid. A temperature of 220-230° C. is necessary to effect a complete decomposition, while a partial decomposition takes place at 180°.

Hyoscine and Belladonine. A. Ladenburg and C. F. Roth. (*Ber. der deutsch. chem. Ges.*, xvii. 151, 152.) Hyoscine was isolated by the authors from the residues from the preparation of hyoscyamine. It is resolved by the action of alkalis into tropaic acid and pseudotropine, a base isomeric with tropine. Pseudotropine melts at 106°, tropine at 62°. It boils at 241-243°. It crystallizes in rhombohedra, which are soluble in water and in chloroform. By the action of methyl iodide upon an aqueous solution of the base at 100°, it is converted into the methyl iodide, $C_8H_{15}N.CH_3I$. On bringing this compound into contact with recently precipitated silver chloride, the iodine is replaced by chlorine, and the chloride thus formed gives with $PtCl_4$ the platinum-chloride, $(C_8H_{18}N.HCl)_2PtCl_4$, which crystallizes in orange-coloured shining plates.

Belladonine.—The authors have investigated the action of alkalis

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upon this base. Amongst the products of resolution they identified tropine, an oxytropine, and tropaic acid. Further researches upon this base are in progress.

Derivatives of Pilocarpine. P. Chastaing. (*Comptes Rendus*, xcvi. 1435.) The author describes compounds obtained by the action of bromine on pilocarpine. For details the reader is referred to the original paper.

The Alkaloids of Angustura Bark. G. Koerner and C. Boehringer. (*Gazz. Chim. Ital.*, xiii. 363-367; *Journ. Chem. Soc.*, 1884, 341.) In this preliminary notice the authors, after some historical details as to the introduction of the bark, state that it contains aromatic substances and several alkaloids, the amount of the latter varying in different specimens from 0·8 to 1 per cent. The alkaloids are mostly in the free state, and may be extracted directly from the bark by means of ether. After the ethereal extract has been washed with dilute potash solution, the addition of oxalic acid or dilute sulphuric acid gives a yellow crystalline precipitate of the corresponding salt of one of the alkaloids, *cusparine*, whilst other alkaloidal salts remain in solution.

The precipitated cusparine salt is moderately soluble in boiling alcohol, and, on cooling, crystallizes out in slender needles of a magnificent greenish yellow; this colour is not removed by repeated crystallization, or by treatment with animal charcoal, and other salts of the alkaloid, obtained from the yellow precipitate by decomposition, are also intensely yellow. If, however, the free cusparine, $C_{19}H_{17}NO_3$, obtained from these coloured salts, is crystallized several times from light petroleum, and then reconverted into the salt, this is found to be colourless. The author has been unable to ascertain the cause of this yellow coloration. The alkaloid crystallizes from light petroleum in tufts of slender needles melting at 92° ; it is moderately soluble in ether, more readily in alcohol. The sulphate, oxalate, and hydrochloride of the base are but sparingly soluble in water; the acetate is much more soluble, but the solution is decomposed if largely diluted; the tartrate dissolves readily. The platinochloride was obtained as an orange-yellow crystalline precipitate.

When treated with potassium hydrate, cusparine splits up, yielding a new alkaloid and the potassium salt of an acid which seems to be an aromatic derivative; the acid is sparingly soluble, and crystallizes readily. The alkaloid crystallizes from alcohol, in which it is very sparingly soluble, in minute, very brilliant, colourless needles; it decomposes at 250° without melting. An

attempt to decompose the cusparine in a similar manner by the action of hydrochloric acid failed, as it began to carbonize even at 100°.

In the mother-liquors from which the cusparine was originally precipitated as sulphate or oxalate, another alkaloid is found, to which the authors have given the name of *gallipeine*, $C_{30}H_{31}NO_3$. The free base crystallizes from light petroleum in white needles melting at 115.5°. It may be obtained in well-formed transparent prisms from its solution in ether or alcohol. All the salts of this alkaloid are more soluble than those of cusparine; several of them are of a magnificent greenish yellow, like uranium salts. The sulphate crystallizes in large prisms with 7 mols. H_2O , which it loses in part on exposure to the air; it melts at 15°, and at 100° undergoes decomposition, yielding the sulphate of another alkaloid and a crystalline nitrogenous substance which melts at 196°. The platino-chloride crystallizes in prisms with a triangular base.

Besides cusparine and gallipeine, the authors have found another alkaloid, which melts at 180°, and is very sparingly soluble in ether. It crystallizes from alcohol, and furnishes salts, the solutions of which have a blue fluorescence.

The property these alkaloids have of being transformed into other alkaloids, with simultaneous formation of acids, is interesting, and may throw some light on the constitution of vegetable alkaloids in general.

Solubility of Strychnine in Acids. MM. Hanriot and Blarez. (*Comptes Rendus*, xcvi. 1504-1506.) Though strychnine is soluble in very dilute acids, its solubility is markedly lessened when the acids are used in a less diluted condition; and this is especially the case when the acid employed is the same as that contained in the salt of strychnine experimented with. Concentrated solutions of strychnine salts, when slightly acidified, form precipitates which are soluble in an excess of acid, and are reprecipitated from this solution upon dilution with water.

Behaviour of Strychnine in the Animal; and a Product of the Action of Potassium Permanganate on Strychnine. P. C. Plugge. (*Chemical News*, xlviii. 207.) The contention as to whether alkaloids do or do not undergo decomposition in the animal organism has never been definitely settled. Kerner (*Pflüger's Archiv*, ii. 20; iii. 30) proved that quinine in part reappears unchanged in the urine, whilst another portion becomes oxidized into dihydroxyquinine, a substance which is also obtained by the action of potassium permanganate on quinine. The author has made similar experi-

ments with strychnine. Strychnine was given to animals; and the blood, tissues, and urine were examined. The results obtained indicate that the strychnine is decomposed in the organism, but the investigation is incomplete.

By the action of potassium permanganate on strychnine, a yellowish brown or light grey amorphous substance is obtained. It is sparingly soluble in cold water, ether, and chloroform, more freely in hot water, from which it is partially deposited on cooling; readily soluble in alcohol, and very readily in dilute aqueous alkaline solutions, from which it is incompletely reprecipitated by adding hydrochloric acid. The substance is neither bitter nor poisonous, and is not precipitated by the usual alkaloid reagents. Treated with chromic mixture, it gives a red-violet coloration without the preliminary blue-violet, as is the case with strychnine. The author regards this strychnine-derivative as strychnic acid, to which he assigns the formula $C_{11}H_{11}NO_3, H_2O$, for the present.

Solubility of Strychnine, and Preparation of some of its Salts. P. Crespi. (*Gazz. Chim. Ital.*, xiii. 175; *Journ. Chem. Soc.*, 1884, 187.) The author has determined the solubility of strychnine at ordinary temperatures and at 56° , 78° , and 98.5° in various solvents. He finds that 1 part of water at 14.5° dissolves 0.025 part of strychnine; that 1 part absolute alcohol dissolves from 0.302 to 0.325 at 8.25° and 10.75° ; 0.975 at 56° , and 1.846 at 78° ; that amyl alcohol, one of the best solvents, dissolves 0.525 at 11.75° , and 4.262 at 98.5° ; that its solubility in dilute alcohol increases with the proportion of water up to 85° of Gay-Lussac's areometer, and diminishes with greater dilution. The salts described are the normal succinate, $C_4H_4O_4 \text{ Str}_2, 6\frac{1}{2}H_2O$; normal malate, $C_4H_6O_5 \text{ Str}_2, 5\frac{1}{2}H_2O$; normal pyrotartrate, $C_6H_8O_4 \text{ Str}_2, 5\frac{1}{2}H_2O$, and the phthalate, which has not been analysed.

Crystallized Colchicine. A. Houdès. (*Comptes Rendus*, June 9, 1884.) Colchicine appears in the form of prisms grouped in colourless bundles; it is intensely bitter, turns litmus-paper slightly blue, is sparingly soluble in water, glycerine, and ether, but readily in alcohol, benzol, and chloroform. It combines with certain organic acids, but is decomposed by such as act more energetically, and also by the mineral acids. The author proposes to examine how this precipitate differs from that of Oberlin.

Berberine. E. Schmidt. (*Ber. der deutsch. chem. Ges.*, xvi. 2589.) The composition of the alkaloid berberine has at different times been represented by contradictory formulæ; an attempt has therefore been made by J. Court to clear up the confusion.

Numerous analyses of the free base, the hydrochlorate, nitrate, and sulphate have been made, the results of which point to the formula $C_{20}H_{17}NO_4 + 4H_2O$. With the exception of the water of crystallization, this agrees with the results of Perrin and Hlasiwetz. Upon oxidation of the alkaloid in weak alkaline solution, carbonic anhydride was evolved, and the principal product of the decomposition was a bibasic acid resembling in composition and melting-point hemipinic acid; but whether it is identical in all its characters with hemipinic acid from narcotine has not yet been determined.

Berberine. O. Bernheimer. (*Ber. der deutsch. chem. Ges.*, xvi. 2685.) The author has also made the observation that when berberine is distilled with a considerable excess of potassium hydrate, besides two acids that have been described by Hlasiwetz, chinoline is formed, which has been identified by its platinum salt.

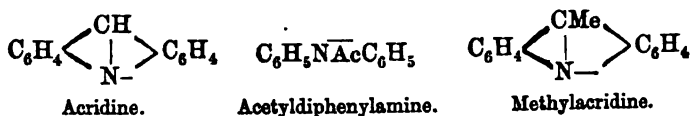
Synthesis of Nicotine. J. Mensel. (*American Druggist*, 1884, 41.) The author states in the *Pharmaceut. Zeitung*, Sept. 26, 1883, that he has formed nicotine artificially in the following way:—

Benzoic acid is dissolved in acetone, and the whole mixed with concentrated sulphuric acid. A precipitate is thereby formed, which on heating redissolves in the excess of acetone. When cool, a solution of ammonia gas in absolute alcohol is added, whereupon ammonium sulphate precipitates out, and nicotine is found with other products of decomposition and undecomposed acetone in the supernatant liquid.

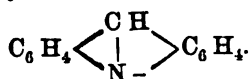
New Method for Producing Acridine. O. Fischer and G. Koerner. (*Ber. der deutsch. chem. Ges.*, xvii. 101; *Journ. Chem. Soc.*, 1884, 748.) This consists in heating a mixture of chloroform (1 part), diphenylamine (1 part), zinc chloride (1 part), and zinc oxide ($\frac{1}{2}$ part), for seven to eight hours at 200–210°. The product is boiled with concentrated hydrochloric acid, the filtrate poured into water, and the acridine precipitated by alkali. The reaction, $NHPh_2 + CHCl_3 + ZnO = C_{13}H_9N + HCl + ZnCl_2 + H_2O$, is analogous to the formation of acridine from diphenylamine and formic acid, but the yield is considerably better. The base obtained by the authors melted at 110–111°. Aluminium chloride may be substituted for the zinc chloride with advantage.

Acridine. O. Fischer. (*Journ. Chem. Soc.*, from *Ber. der deutsch. chem. Ges.*, xvi. 1820–1821.) The base, $C_{14}H_{11}N$, obtained by the action of glacial acetic acid and zinc chloride on diphenylamine (*Ber.* xvi. 68) bears such a close resemblance in its properties to acridine, recently described by Riedel (*Ibid.*, xvi. 1612), that the author considers it may be regarded as *methylacridine*. The for-

mation of methylacridine from acetyldiphenylamine is easily explained by means of Riedel's formula for acridine.

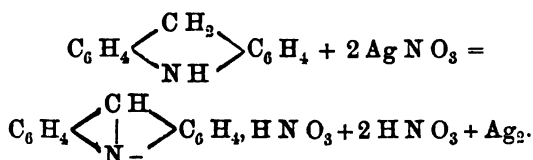


Acridine. A. Bernthsen and F. Bender. (*Ber. der deutsch. chem. Ges.*, xvi. 1971-1974.) The authors' researches have shown that the composition of acridine is represented by the formula $\text{C}_{13}\text{H}_9\text{N}$, and not $\text{C}_{12}\text{H}_9\text{N}$, and its constitution thus:

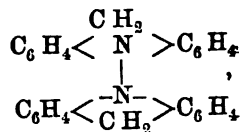


Accordingly, hydroacridine, obtained by the action of reducing agents on acridine, will possess the constitution, $\text{C}_6\text{H}_4 \begin{array}{c} \text{CH}_2 \\ | \\ \text{N} \text{H} \end{array} \text{C}_6\text{H}_4$.

The authors point out that the same soluble hydrophenylacridine is formed, whether phenylacridine is reduced by sodium amalgam or by zinc and hydrochloric acid. Further, hydroacridine in alcoholic solution is decomposed by silver nitrate in accordance with the equation—



Insoluble hydroacridine has the constitution,



which the authors propose to prove by the silver nitrate reaction. The relation of acridine to quinoline and pyridine is also discussed.

Sparteine. O. Bernheimer. (*Gazz. Chim. Ital.*, xiii. 451; *Journ. Chem. Soc.*, 1884, 337.) This base, $\text{C}_{15}\text{H}_{28}\text{N}_2$, was first obtained from *Spartium scoparium*, by Stenhouse in 1881, who determined its composition; and was afterwards examined by Mills, who showed that it is a tertiary diamine. The sparteine examined by the author was prepared from *Spartium scoparium* by a slight modification of Stenhouse's method; it distilled to the last drop at

180–181° under a pressure of 20 mm. Its solution in alcohol at 96° has a specific rotatory power $[\alpha]_D = -14.6$ for a concentration of 23.88 at 26°. It bears a heat of 200° without alteration, but becomes partially carbonized at higher temperatures; is not decomposed by heating in sealed tubes with hydrochloric acid. Bromine acts strongly on sparteine at ordinary temperatures, even when it is largely diluted with ether, forming an undefined resinous mass.

On gradually adding 3 parts of iodine dissolved in ether to an ethereal solution of 1 part of sparteine, the iodine is decolorized, and a black precipitate is formed, which when separated, washed with ether to remove free iodine, and dissolved in boiling alcohol, separates on cooling in beautiful green needles, having the composition $C_{15}H_{28}N_2I_3$. This compound is insoluble in cold water and alcohol, but dissolves readily in those liquids when heated; it is insoluble in ether, permanent in the air, and yields free sparteine when heated with potash.

Sparteine (as sulphate) oxidized with potassium permanganate yields a small quantity of a volatile acid, having the odour of the fatty acids, together with a non-volatile acid having the composition of a *pyridinemonomocarboxylic acid*, $C_5H_4N.COOH$; and on distilling a salt of this acid with lime, a volatile base is obtained having all the properties of pyridine. The author intends to continue his experiments as soon as he is in possession of a larger quantity of material.

Lycaconitine and Myoctonine. MM. Dragendorff and Spohn. (*Ph. Zeit. für Russl.*, xxiii. 313; *Pharm. Journ.*, 3rd series, xv. 82.) Twenty years ago Dr. Hübschmann described, under the names "lycoctonine" and "acolyctine," two new alkaloids that he had discovered in the roots of the yellow-flowered *Aconitum Lycoctonum*. Subsequently these compounds were further investigated by Professor Flückiger and others, amongst whom Messrs. Wright and Luff came to the conclusion that they were identical with aconine and pseudaconine, the decomposition products of aconitine and pseudaconitine respectively (*Pharm. Journ.* [3], viii. 169). The subject has recently been taken up afresh by the authors, who report that they have found Hübschmann's lycoctonine and acolyctine to be really decomposition products, though not of aconitine and pseudaconitine, but of two hitherto unnoticed alkaloids peculiar to *A. Lycoctonum*, which they have named "lycaconitine" and "myoctonine," and represent by the formulæ $C_{27}H_{34}N_2O_6$, and $C_{27}H_{30}N_2O_8$. Some physiological experiments made by Herr Jacobowsky appeared to show that lycaconitine is

an energetic poison, resembling curare in its action, but not suitable for therapeutic purposes, as it is imperfectly absorbed by the stomach, and under the influence of the secretions passes into a condition in which it is inert.

An Alkaloid derived from Crotonic Aldehyde. A. Combes. (*Comptes Rendus*, xcvi. No. 26.) The author has obtained an oxygenated base from crotonic aldehyde by dissolving this compound in anhydrous ether, cooling to -20° , and saturating the liquid with dry ammoniacal gas. The compound obtained has a distinctly alkaline reaction, and forms a well crystallized salt with hydrochloric acid, and a double salt with platinum chloride.

An Alkaloidal Substance in Maize. O. Luxardo. (*Gazz. Chim. Ital.*, xiii. 94-97.) Maize flour was extracted with dilute sulphuric acid, the extract treated with basic lead acetate, filtered, and slowly evaporated; the residue was then exhausted with absolute alcohol, and the alcohol removed by distillation; the substance thus obtained was examined for alkaloids by the methods detailed in the paper. From the results, the author infers that in sound maize seeds there may be nitrogenous substances analogous to alkaloids and ptomaines in their behaviour with reagents. He notices, however, that the methods of Dragendorff and Stas and Otto, based as they are on the treatment of the substance with dilute acids, may give rise to basic substances by the action of the acids on the albuminoid substances present in the seeds, especially if warmed with them, and therefore they do not afford certain evidence that the basic substances were originally present as such.

Hydrocyanides of Organic Bases. A. Claus and E. A. Merck. (*Ber. der deutsch. chem. Ges.*, xvi. 2737-2748; *Journ. Chem. Soc.*, 1884, 338.) Aniline, toluidine, quinine, cinchonidine, and strychnine, dissolve in aqueous hydrocyanic acid. An excess of acid renders the solution very unstable. The salts have not been isolated, as they are decomposed by evaporation in a vacuum. Although the bases are completely withdrawn from these liquids by ether, the solutions are not mere mechanical mixtures, since they yield double cyanides with mercuric cyanide; e.g., when mercuric cyanide is added to a solution of aniline hydrocyanide, white tabular crystals, $\text{N H}_2 \text{ Ph}, \text{H C N} + \text{Hg (C N)}_2$, are deposited, which dissolve in water, alcohol, and ether.

When mercuric cyanide is added to tetramethylammonium iodide, two salts are formed, viz., a white salt of the composition $\text{N Me}_4 \text{ I}, \text{Hg (C N)}_2$, freely soluble in water, and a yellow salt, $\text{N Me}_4 \text{ C N}, \text{Hg I C N}$, sparingly soluble in water. The white salt

slowly changes into the yellow isomeride at the ordinary temperature, more rapidly at 200°.

Tetramethylammonium cyanide, $\text{N Me}_4 \text{C N}$, prepared by the action of barium cyanide on tetramethylammonium iodide, has been described by C. Thompson. The clear crystals of the salt become opaque at 150°, decrepitate at 215°, and melt at 295°. The salt can be volatilised at 225–230° without melting. With mercuric cyanide it forms a double salt, $\text{N Me}_4 \text{C N}, \text{Hg} (\text{C N})_2$, crystallizing in prisms melting at 275°. The corresponding silver salt, $\text{N Me}_4 \text{C N}, \text{Ag C N}$, has been described by Thompson. Tetramethylammonium cyanide dissolves cobalt cyanide and ferrous cyanide, forming tetramethylammonium cobalticyanide and ferrocyanide respectively. The latter compound has been described by Barth (*Ber.*, viii. 1484.) The former crystallizes in yellow plates, and resembles the potassium cobalticyanide in its properties.

Cinchonidine ethylcyanide, $\text{C}_{19} \text{H}_{23} \text{N}_3 \text{O}, \text{Et C N}$, prepared by the action of barium cyanide on cinchonidine ethylsulphate, forms white crystalline needles, which are decomposed by carbonic acid, and rapidly absorb moisture from the air. It is soluble in water but insoluble in ether and chloroform. The crystals melt with decomposition at 140°. *Quinine ethylcyanide*, $\text{C}_{20} \text{H}_{24} \text{N}_3 \text{O}_2, \text{Et C N}$, crystallizes in needles soluble in alcohol. The crystals melt at 90°, and begin to decompose at 95°. *Strychnine ethylcyanide*, $\text{C}_{21} \text{H}_{23} \text{N}_3 \text{O}_2, \text{Et C N}$, is less hygroscopic and more stable than the quinine and cinchonidine compounds. It dissolves freely in water, but is less soluble in alcohol.

Alkaloids Produced by Putrefaction. A. Poehl. (*Ber. der deutsch. chem. Ges.*, xvi. 1975–1981. From *Journ. Chem. Soc.*) Epidemics caused by unsound bread have long been recognised, and it has been observed that they are preceded by long-continued rains and floods, which cause an abundance of ergot (*Claviceps purpurea*) in the following harvests. These epidemics take two forms, viz., *Ergotismus convulsivus*, more common in France, Switzerland, and this country; and *Ergotismus gangrænosus*, which prevails in Russia, Germany, and Sweden. In Russia there were two remarkable outbreaks of the latter in the years 1832 and 1837, which caused a mortality among children attacked of 1:1.75 to 1:4, and of the former in 1824. In the course of the rainy summer of 1881, Russia was threatened with another outbreak of ergotismus; accordingly the Minister of the Interior instituted a Commission, of which the author was a member, to investigate this phenomenon of ergot.

Eichwald, in his history of ergotismus epidemics, has shown : (1) that the appearance of the epidemic stands in no direct relation to the proportion of blight in the grain ; (2) that animals cannot be so inoculated so as to produce in them similar symptoms ; (3) that the putrefaction of the corn is a necessary condition of the ergotismus ; (4) that the poisonous results are produced only in certain stages of the decomposition ; (5) that the various forms of ergotismus cannot be explained by the quantity of ergot introduced within the system, or its time of action.

In the present paper the author elucidates the following conditions of the putrefaction alkaloids in blighted rye meal : (1) the conversion of the starch into glucose ; (2) fermentation of the glucose, with formation of lactic acid ; (3) peptonisation of the albumens by the peptic action of the mycelium of *Claviceps purpurea* ; (4) conversion of the peptone into ptomopeptone, and its decomposition with formation of putrefaction alkaloids.

Firstly. In the year 1873, the author recognised that damp caused in the meal a large proportion of glucose, by the action of a ferment contained in the endocarp and perisperm of the grain. The experiments of Hammarsten have also proved that the starches of maize, rye, and oats are more easily converted into glucose by diastatic action than the starches of potatoes, peas, and wheat. In this connection it may be mentioned that the inhabitants of Lombardy suffer from an epidemic caused by maize. A form of mildew has been observed on maize, and this has the power of peptonising albumens, with formation of putrefaction alkaloids.

Secondly. In presence of a ferment the glucose would further decompose into butyric and lactic acids.

The author further observed that rye grain, even if not attacked by the *Claviceps*, yet when merely exposed to damp evolved trimethylamine when heated with alkalies ; and it is well known that albumens at the moment of putrefaction evolve ammonia or amines under the action of alkalies.

Thirdly. One of the most important phenomena of the change of the albumen of meal is the formation of peptones ; it has also been noticed that lactic acid is a better test for peptonisation than other acids, as phosphoric, acetic, oxalic, or tartaric. The author has frequently observed the formation of peptone from the albumen of meal, caused by the action of *Penicillium glaucum* and the fungus of *Claviceps purpurea*, the latter of which produces the most marked effects.

Fourthly. The author exposed pure and tainted rye meal to a

damp atmosphere, and found that the latter more readily entered into decomposition, with formation of the putrefaction alkaloids or ptomaines. Further, large quantities of pure and tainted meal were allowed to rot, and the putrefying mass examined from time to time by Stas-Otto's process. From alkaline and from acid ethereal extracts of the mass, substances were obtained of various degrees of consistence and of various odours. These products gave all the general reactions for alkaloids, and differed from one another towards precipitants and colour reagents according as they had been obtained at various stages of the decomposition. By shaking the alkali solution with chloroform, benzene, and amyl alcohol, an alkaloid was obtained, which gave precipitates with potassium-mercuric iodide, phosphomolybdic and tungstic acids, potassium-bismuth and -cadmium iodides, platinum and gold chlorides, etc. It also gave a beautiful violet coloration with Fröhde's reagent (sulphuric acid and sodium molybdate), resembling that produced by morphine; the absorption-spectra, however, of the two alkaloids differ most markedly. The author was only able to observe the formation of the above alkaloid during summer time.

Starting from the view that peptones on further putrefaction are converted into ptomopeptones which yield nitrogen when heated with sodium hypobromite, then the quantity of nitrogen so evolved may be taken as a measure of this conversion. Accordingly the author made comparative experiments with samples of damp rye-meal and meal mixed with peptic ferment, with 5 per cent. ergot, and with blight. The results are given in the table below.

Time of Action.	Percentage of Nitrogen given off from			
	Pure Meal.	Meal with Blight.	Meal with Ergot.	Meal with Peptic Ferment.
3 days . .	0.1816	0.1671	0.1933	0.3762
4 „ . .	0.1527	0.2592	0.2909	0.3949
8 „ . .	0.1989	0.2842	0.3157	0.4210
13 „ . .	0.2196	0.3415	0.4269	—
20 „ . .	0.5259	—	0.5662	—

From these results it follows: (1) that ergot and mould have a peptonising action on the albumens and favour their decomposition; (2) the degree of putrefaction of the albumens is directly proportional to their peptonisation; (3) in the first stages of putrefaction, the decomposition of the albumens is greater in ergot meal than in mouldy or pure meal, but in the more advanced stages

these differences are not so marked. Further researches on the decomposition of albumen by the *Claviceps purpurea*, and the part played by various genera of fungi are promised.

Alkaloids Produced by Putrefaction. L. Brieger. (*Ber. der deutsch. chem. Ges.*, xvi. 1186-1191.) A previous paper on this subject by the same author will be found in the *Year-Book of Pharmacy*, 1883, 80. In the first stages of putrefaction of albuminoids, poisonous compounds are produced which resemble curare in their physiological action: they disappear again after the putrefaction has gone on for eight to ten days. To extract the poisonous bases from flesh, the following process is employed: Finely chopped horseflesh is stirred up with water and exposed to putrefactive fermentation for five or six days. The mixture is then boiled and filtered, and lead acetate is then added to the filtrate. The lead salt is decomposed by sulphuretted hydrogen, and the filtrate after concentration is extracted with amyl alcohol. Oxy-acids are removed by acidifying with sulphuric acid and extracting with ether. The sulphuric acid is precipitated by baryta, and the excess of baryta by carbonic acid. The alkaloid is then precipitated by the addition of mercuric chloride. The precipitate decomposed by sulphuretted hydrogen, and the filtrate concentrated, inorganic bodies first crystallize out; but on concentrating the mother-liquor, a compound is deposited in needle-shaped crystals of the composition $C_5H_{14}N_2H_2Cl_2$. This substance is soluble in water and spirits of wine, but is precipitated by alcohol. The pure hydrochloride is slightly poisonous, but the impure salt has a more powerful action. This substance could not be prepared from fibrin or albumen, but only from flesh. On treating the hydrochloride with moist silver oxide, an unstable gelatinous mass is obtained, which resembles seminal fluid in odour. On distillation with soda, a mixture of *di-* and *tri-methylamine* is formed.

The filtrate from the mercuric chloride precipitate mentioned above contains a poisonous base, which forms a platinochloride of the composition $(C_5H_{11}N)_3, H_2PtCl_6$. A small dose of the hydrochloride produces a rapid flow of the saliva, strong secretions from the nose, and constant flow of watery fluid from the intestines, and finally convulsions.

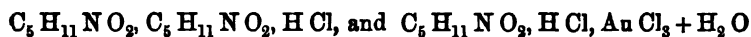
Putrefaction Alkaloids. L. Brieger. (*Ber. der deutsch. chem. Ges.*, xvi. 1405-1407. From *Journ. Chem. Soc.*) The gelatinous product which the author obtained by treating the hydrochloride, $C_5H_{14}N_2H_2Cl_2$, of the base contained in putrefying flesh with moist silver oxide, is the free base, and not an oxidation product, as

the author formerly believed. The salts do not possess the characteristic disgusting smell of the free base; this has not yet been obtained in a crystalline state. It is sparingly soluble in amyl alcohol, freely soluble in water, insoluble in ether and in absolute alcohol. It gives white precipitates with mercuric chloride and lead acetate, a yellow precipitate with potassium cadmium iodide, and a red precipitate with potassium bismuth iodide. It does not exhibit any reaction with the other reagents for alkaloids.

The poisonous base, $C_5H_{11}N$, formed by the putrefaction of flesh, is precipitated by mercuric chloride and basic lead acetate. It is readily soluble in ether and alcohol. A subcutaneous injection of this poison causes increased activity of the heart, rapid respiration, and a copious secretion of saliva exhibiting an alkaline reaction. Under the influence of this alkaloid, cats perspire freely at the paws, and their sweat has an alkaline reaction.

Alkaloids Produced by Putrefaction. E. and H. Salkowski. (*Ber. der deutsch. chem. Ges.*, xvi. 1191-1195.) The authors have continued their research on the putrefaction of flesh and fibrin. (*Ber.* xii. 648), and find that two bases are produced. The non-volatile portion of the product is concentrated, rendered alkaline by the addition of sodium carbonate, and treated with alcohol. The alcoholic extract is evaporated, acidified with dilute sulphuric acid, and extracted with ether. A base remains in the sulphuric acid, but has not yet been investigated. The oily liquid which remains on evaporating the ethereal solution is dissolved in sodium carbonate solution, and after precipitating the higher acids of the acetic series with barium chloride, the filtrate is acidified with hydrochloric acid and extracted with ether. The residue left on evaporating this extract is purified by solution in absolute alcohol and conversion into the platinochloride; this forms orange-coloured crystals soluble in hot water. The crystalline hydrochloride is very soluble in water and in alcohol. The aurochloride forms dark yellow monoclinic crystals, which melt below 100° . The free base obtained by the action of silver oxide on an aqueous solution of the hydrochloride is a white crystalline powder (m. p. 156°) having a peculiar odour. It is freely soluble in water, insoluble in ether, and only sparingly soluble in alcohol. It does not appear to have a poisonous effect on animals.

The analysis of the free base, hydrochloride, and gold salt, agree with the formulæ—



respectively, but the analysis of the platinochloride corresponds with the formula $(C_7 H_{15} N O_3)_2, H_2 Pt Cl_6$.

This seems to indicate that the crystalline substance is a mixture of homologous bases.

Ptomaines. J. Guareschi and A. Mosso. (*Journ. für pract. Chem.* [2], xxvii. 425-432.) 140 kilos. of well washed fibrin from ox-blood was placed in two glazed earthenware vessels, covered with a large zinc bell, whose edges dipped about 15 cm. deep into water, and allowed to stand for five months. The fibrin had at the end of that time been converted into a thick dark-red homogeneous liquid. This was acidulated with sulphuric acid, evaporated at 60° to a thick paste, baryta-water added to alkaline reaction, filtered after twenty-four hours, and the filtrate and wash-waters shaken for a long time with chloroform. (The extraction with chloroform was repeated 12 times; all the extracts contained the same ptomaine.) The chloroform extract was evaporated, and the resulting dark golden-yellow oily residue mixed with tartaric acid; a resin that then separated was removed by shaking with ether, and the now colourless liquid mixed with excess of 50 per cent. potash, and the liberated oil extracted with ether. On evaporating the ethereal solution, a strongly alkaline brown oil of faint pyridine or conine-like odour was obtained. It is sparingly soluble in water, and resinifies very readily. The *hydrochloride* crystallizes in somewhat deliquescent, colourless, cholesterin-like plates. The *platinochloride*, $C_{10} H_{18} N, H_2 Pt Cl_6$, forms a light flesh-coloured crystalline precipitate, insoluble in water, alcohol, and ether; it is not decomposed at 100° . (The platinochloride from each chloroform extract was analysed, and showed that only the one ptomaine was present.) The hydrochloride gave a crystalline yellow precipitate with auric chloride; white precipitates with Mayer's reagent, mercuric chloride, or tannin; a yellow precipitate with phosphomolybdic acid, sparingly soluble in ammonia without blue coloration; and a whitish yellow precipitate with phosphotungstic acid. The physiological action of the ptomaine is similar to that of curare, but is much less active than the latter.

Ptomaines and Analogous Compounds. A. G. Pouchet. (*Comptes Rendus*, December 31, 1883.) The author's experiments have already led him to regard the alkaloidal compounds existing in the excretions as identical with, or at least closely similar to, those which form during the putrefaction, in the absence of air, of proteic matters, and of various organs of the animal system. The basic bodies extracted from both these classes of matter are

probably mixtures of homologous bodies. By a tedious process he obtains two distinct classes of compounds, a liquid portion, dialysable only with difficulty, and a portion containing crystallizable substances and readily capable of dialysis. For the former the author reserves for the present the name "extractive" matter of urine. Among the products of putrefaction the same two classes of compounds are recognised. The volatile bases found in the crystallizable portion resemble the hydropyridic bases detected by MM. Gantier and Etard. All the compounds isolated are violent poisons for frogs, which they kill rapidly, occasioning torpor and paralysis, with abolition of the reflex movements.

A Ptomaine Resembling Picrotoxin. Prof. Giacomelli. (*Zeit. des österr. Apoth. Ver.*, March 1, 1884.) The author reports the occurrence of a ptomaine presenting a close resemblance to picrotoxin in its physical appearance and chemical reactions. The only reaction in which the two bodies appear to differ was that dissolved in water and a few drops of neutral acetate of lead solution added, upon boiling the mixture, the ptomaine remained unaltered, whilst the picrotoxin yielded a black precipitate, leaving the supernatant liquid colourless. They differed, however, entirely in physiological action. It will be remembered that the discovery of a similar body in beer some time ago, gave rise at first to the suspicion that *cocculus indicus* had been used, but afterwards its origin was attributed to alteration of albuminoid substances normally present in the liquor.

The so-called Ptomaines in Relation to Toxicological Researches. F. Marino-Zucco. (*Gazz. Chim. Ital.*, xiii. 431; *Journ. Chem. Soc.*, 1884, 342.) The author's experiments were made on a variety of fresh animal substances, viz., white and yolk of egg, brains, lungs, heart, liver, spleen, and blood, several methods being employed, with strict attention to all the conditions indicated by their respective authors. The result of these experiments was the extraction of a base which exhibited all the usual reactions of the alkaloids, but had the constitution of an ammonium hydroxide, and in those cases in which an aurochloride could be prepared and analysed, was found to be identical in composition with neurine. In one instance traces were also found of the so-called "animal quinine."

To determine the origin of this neurine, the author applied the methods above mentioned to the lecithins (prepared by Strecker's method from egg-yolk), and found that these substances behave in the same manner as, for example, a mass of brain, egg, lungs, etc.

On applying the same method to the albumen remaining after complete extraction of the lecithins, the result was purely negative. Hence it is clear that the so-called ptomaines obtained in the extraction of fresh animal substances, originate, not as is generally supposed, from sudden alteration of the proteids, but from the splitting up of the lecithins under the influence of acids or alkalies.

As neurine hydrochloride is not decomposed by sodium bicarbonate, the author was able to determine the toxicological question in cases of the extraction of alkaloids from substances in which putrefaction has not yet commenced. The hydrochlorides of the alkaloid and of the so-called ptomaines, simultaneously extracted, are dissolved in water, and the liquor, rendered alkaline with sodium bicarbonate, is agitated with the solvent. The neurine then remains dissolved in the water as hydrochloride, and the alkaloid may then be extracted alone. This has been demonstrated by all the experiments made as above described, and by others on yolk of egg mixed with strychnine.

Selmi's Ptomaines. F. Marino-Zubo. (*Gazz. Chim. Ital.*, xiii. 441.) In this paper, the author describes a number of experiments, chemical and physiological, tending to establish the conclusion indicated in the preceding abstract, as to the identity of these bases with neurine. The most characteristic chemical reactions observed in both cases are:

With *Phosphoric acid*: a light brown coloration on heating.

„ *Platinic chloride*: no precipitate, but deposition of yellowish crystals after a short time.

„ *Mercuric chloride*: white precipitate.

„ *Auric chloride*: yellowish precipitate, and after a short time reduction of metallic gold.

„ *Iodised potassium iodide*: red-brown precipitate, which, however, soon redissolves.

Ptomaines and their Significance in Toxicology. T. Husemann. (*Archiv der Pharm.* [3], xxi. 401-417.) The commencement of a history of the ptomaines, and the methods of detecting them and distinguishing them from vegetable alkaloids, compiled from the papers of recent investigators.

The Chemical Composition and Properties of a Crystalline Principle obtained from Jambosa Root. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, March, 1884.) The roots from which the principle under notice was extracted were handed to the author with the following information:—

“The plant yielding these roots is probably the *Myrtus Jambosa*, L.

(*Jambosa vulgaris*, D. C.), cultivated on St. Maurice. The fruit has the circumference of a medium sized pear, a smell reminding of roses." In the same communication the plant is also mentioned as the "*Myrtus Jambosa Malacensis*, Spr. Is at home in India and Otaheiti. The fruit is known as the rose apple, is frequently eaten, and the decoction of the bark used as an astringent in dysentery, gonorrhœa, and leucorrhœa."

Dr. Lyons's examination of the root demonstrated that it contained a neutral crystalline principle, an alkaloid, a peculiar acid, and an oleoresin.

The extraction of the crystalline principle, which is found only in the bark of the root, is extremely easy. The author's process is as follows:—The bark was separated from the root, finely powdered and percolated with ether; the ether on evaporation gave an abundant crop of crystals, which by washing with ether and again crystallizing from ether were obtained perfectly white.

Properties of Crystals.—They are white and tasteless, melting at 77° C., becoming solid at 60° C.; soluble in cold ether, alcohol, and chloroform, and in hot petroleum ether. They are insoluble in cold water, but soluble on boiling, separating in crystals on cooling. With strong sulphuric acid they yield a bright green colour, soon passing to a deep reddish brown. With strong nitric acid they react violently, giving off nitrous fumes and forming an orange coloured liquid, from which water precipitates a new compound. They gave none of the reactions of a glucoside, neither do they possess the character of weak resin acids.

The analysis of the crystals gave numbers leading to the formula $C_{10}H_{15}NO_3$. The author proposes for this substance the name *jambosin*. Therapeutically it appears to be of very little interest. The active principle of jambosa is probably contained in the oleoresin, which is a powerful sialagogue, and deserving of further research.

A New Glucoside from *Strychnos Nux-Vomica*. W. R. Dunstan and F. W. Short. (*Pharm. Journ.*, 3rd series, xiv. 1025.) A preliminary communication in which the authors show that the pulp of the fruit of *Strychnos Nux-vomica* contains, to the extent of 4 or 5 per cent., a new glucoside named by them *loganin*, the chemical properties of which have been described. The substance answers to the formula $C_{25}H_{34}O_{14}$. They have also shown that loganin is contained in small quantity in the seeds of *Strychnos Nux-vomica*, and in the pharmaceutical preparations made from them. The authors hope to be able to indicate the chemical constitution of

loganin and loganethin, and to discover the relations (if any) of these bodies to the alkaloids strychnine and brucine.

The Active Principle of Jamaica Dogwood. E. Hart. (*Amer. Chem. Journ.*, v. 39.) Fluid extract of Jamaica dogwood was mixed with lime, left at rest for half an hour in a warm place, filtered, and water added to the filtrate, from which, after two or three days, crystals of piscidin separate. After purification, it is obtained in nearly colourless microscopic crystals of the formula $C_{29}H_{24}O_8$, and melting at 192° (uncorr.). It is insoluble in water, slightly soluble in ether or cold alcohol, much more soluble in boiling alcohol, readily in benzene and chloroform. It dissolves in strong hydrochloric acid, and is reprecipitated by water apparently unchanged. It does not seem to be a glucoside, and gives no precipitate with lead acetate. The alcoholic solution is neutral in reaction.

Arbutin. H. Schiff. (*Gazz. Chim. Ital.*, xiii. 508; *Liebig's Annalen*, cxxi. 365.) The author describes a number of derivatives of arbutin obtained by the action on it of benzyl bromide and potassium hydrate. For details reference must be made to the original paper, as it is not suited for abstraction.

Arbutin. J. Habermann. (*Monatsh. für Chem.*, iv. 753.) This paper gives a detailed description of a large number of experiments on the composition of arbutin and its behaviour at high temperatures, tending to establish the correctness of the formula $C_{26}H_{24}O_{14}$, deduced by Hlasiwetz and Habermann for arbutin, from the occurrence of methylquinol, $C_7H_8O_3$, as a product of its decomposition (*Ber.* xiv. 302), in opposition to the view put forward by H. Schiff (*Gazzetta*, xi. 99), and Michael (*Ber.* xiv. 2097), that two different arbutins occur in nature, viz., arbutin, $C_{12}H_{16}O_7$; and methylarbutin, $C_{13}H_{18}O_7$.

Quassiin. MM. Adrian and Moreaux. (*Répert. de Pharm.*, xi. 246-50, from *Pharm. Journ.*) Quassiin, the active principle of *Quassia amara*, or Surinam wood, has long been presented in a more or less impure extractive form. The authors have studied the different published methods of extraction, and have arrived at the conclusion that some of these methods give but a defective product; while the others, though producing purer quassiin, remove but a small portion of the bitter principle contained in the wood.

After quoting the methods for extraction given by Soubeiran, Pelouze, Wurtz, Wiggers, and Christensen, the authors state that by the following process, which is their own, a purer and more abundant product is obtained.

Very sound wood reduced to thin shavings is exhausted by the aid

of boiling distilled water, either by displacement or by decoction, carbonate of potash being added to the extent of 5 grams per kilogram of quassia. The liquor is then concentrated by evaporation, first by the open fire, afterwards in a water-bath, to the consistence of a soft extract, a mean of 60 grains per kilogram of quassia being obtained. The extract is afterwards suspended in hot 90° alcohol, and after standing a few moments the supernatant alcohol is decanted; the process being repeated a second and third time, so as to thoroughly exhaust the extract. The alcoholic liquor is allowed to stand twenty-four hours, during which it deposits extractive matter and salts dissolved by the hot alcohol; the liquid should then be decanted, and sulphuric acid diluted with ten times its weight of 90° alcohol added until a precipitate is thrown down, from 2 to 2½ grams being necessary for each kilogram of quassia. The liquor is then filtered, milk of lime added in the proportion of 12 to 15 grams per kilogram of wood (or 4 to 5 grams of caustic lime), and after some hours' contact, it is passed through muslin, and the deposit washed with alcohol and pressed, as it is very spongy and contains much alcoholic liquor.

The liquor being alkaline after the treatment with lime, it is neutralized by a current of carbonic acid, and then again filtered. Thus prepared, the liquor has a light amber tint. It now remains only to distil the alcohol and to dry the residue from the distillation. Each kilogram of quassia yields by this process about 8 grams of a friable and easily pulverized product, which is the amorphous quassiin of Adrian.

If, instead of amorphous, it be desired to obtain crystallized quassiin, the distillation should be stayed while there yet remains a small quantity of alcohol in the product, which is then poured boiling upon a moistened filter to separate the resin. This filter should be so placed that the liquor may be received in a porcelain capsule. The remainder of the alcohol is then evaporated by heating to 80° C., and as the alcohol volatilizes, the quassiin crystallizes out and is deposited. As soon as the liquor contains no more alcohol, it is withdrawn from the fire, when in a few minutes, and before the liquor has quite cooled, it forms a crystalline mass. When quite cold, the mother liquor is decanted and the crystals are washed several times with distilled water. The quassiin thus obtained is not quite pure; it still contains some resin and uncrystallizable quassiin. To purify it, it is dried, and then dissolved by heating it in twice its weight of 95° alcohol. It is then placed to crystallize in a funnel with a very short neck closed by a cork

stopper; in cooling, the quassiin crystallizes, and after ten or twelve hours, forms a mass. The stopper is then removed, and the alcohol which has been used in crystallizing is displaced by 90°, or absolute alcohol, in order to wash the quassiin. As the crystallizing liquor draining away is replaced by fresh alcohol, the coloured quassiin is seen to become white; a second crystallization suffices to render it very fine; the result is from $1\frac{1}{4}$ to $1\frac{1}{2}$ gram per kilogram of quassia.

The mother liquor and the wash waters of the first crystallization retain a considerable quantity of quassiin, which is difficult to entirely extract. A large proportion may be obtained by shaking these liquors several times with chloroform, which dissolves the quassiin and separates very easily from the aqueous liquor. The chloroform is distilled off, and in this way the non-crystallizable quassiin is obtained, it being deposited from the alcoholic solution as a granular resinoid substance, which is very easily softened by heat. Its bitterness is nearly equal to that of the crystallized quassiin. Repeated treatments with chloroform have failed to remove from the aqueous solution the whole of this quassiin, which seems to be combined with mineral salts that it still contains.

The alcohol which has been used in the crystallization, as well as that used in the washing, contains also in solution a little quassiin, both crystallized and uncrystallizable, which may be obtained by the same process as above described.

Résumé.

	Crystallisable Quassiin.	Uncrystallisable Quassiin.	Mineral Salts.	Resin and other Organic Matters.
Viscous, brown, amorphous quassiin in 100 parts contains . .	00 to 00	12 to 15	85 to 40	45 to 50
Yellow amorphous quassiin, in powder, contains in 100 parts .	18 to 20	18 to 20	25 to 80	80 to 35

In brown quassiin, potassium salts predominate.

In yellow quassiin, calcium salts.

Crystallized quassiin is white, light, very soluble in chloroform, soluble in about 90 parts of cold absolute alcohol, in 35 to 40 of 80° alcohol, scarcely soluble in ether, and soluble in about 300 parts of hot water, from which it recrystallizes on cooling.

Uncrystallizable quassiin is very soluble in absolute alcohol, more soluble in ether than crystallized quassiin, and is soluble in water.

Saponin. E. Stütz. (*Liebig's Annalen*, ccxviii. 231-256.) The source of the saponin studied in this paper was the bark of the *Quilbaja saponaria*, a member of the Spireæa family, indigenous in Chili and Peru. This was digested with water, the extract evaporated down, and hot alcohol of 90 per cent. added; on cooling, white flocks of saponin separated, which were then frequently recrystallized from alcohol, and finally purified by animal charcoal.

Saponin thus obtained is a white, amorphous, neutral powder, generally possessing an astringent taste, due to traces of impurities; it is soluble in water, insoluble in absolute alcohol and ether; its aqueous solution forms a lather like soap. When heated to 195° it turns brown, and at a higher temperature evolves a vapour resembling caramel in odour.

The author was unable to obtain saponin free from inorganic impurities; and from the properties of its barium compound it would appear probable that the impurities, principally consisting of calcium, were intimately associated with the saponin. From the mean of four concordant analyses the formula $C_{19}H_{30}O_{10}$ is deduced.

A concentrated aqueous solution of saponin is precipitated by baryta-water; a substance of composition $2C_{19}H_{30}O_{10} + Ba(OH)_2$ being formed, from which the barium is not readily separated by carbonic anhydride. In order to determine the number of alcoholic hydroxyl-groupings present in saponin, it was heated with acetic or butyric anhydride under various conditions. A series of acetyl-derivatives was thus obtained; amongst which are enumerated a tetracetyl, $C_{19}H_{25}\bar{Ac}_4O_{10}$, and a pentacetyl, $C_{19}H_{25}\bar{Ac}_5O_{10}$ derivative, and two compounds formed by the addition of acetic anhydride to the latter substance, viz.,—



From these results it follows that the saponin contains five hydroxyl-groups, and two oxygen-atoms combined only with carbon; its constitutional formula will thus be, $C_{19}H_{25}(OH)_5.O_2.O_3$. From the acetyl-derivatives saponin can be regenerated.

Saponin from Saponaria Officinalis. C. Schiaparelli. (*Gazz. Chim. Ital.*, xiii. 422-430; *Journ Chem. Soc.*, 1884, 332.) The analyses hitherto made of saponin obtained from different plants are not very concordant, the results varying indeed from 47.52 per cent. C and 7.16 H (Overbeck), to 52.63 C and 7.48 H (Roehleder and Schwarz). Moreover, the experiments of the last-named chemist lead to the conclusion that the carbohydrate obtained in the first

instance from saponin by decomposition with acids, is not grape-sugar, but a body convertible into that sugar by the further action of acids, and consequently that saponin is not a glucoside, but an amyloid. To throw further light on this matter, the author has endeavoured to determine whether the products extracted from different plants and included under the name of saponin, are really identical, and in the present paper he describes the results obtained with saponin from *Saponaria officinalis*.

The root of this plant, dried and coarsely pounded, was boiled for three days in a reflux apparatus with alcohol of 90°; after which the boiling alcoholic decoction was separated and left for some days in a cool place, whereupon the sides of the vessel became coated with a copious yellow flocculent deposit which, when freed from colouring matter by treatment with a warm mixture of alcohol and ether, consisted of saponin, still, however, very impure. Treatment with alcohol and animal charcoal still left it contaminated with about 3 per cent. of mineral water. It was, therefore, dissolved in the smallest possible quantity of water; the cold solution was precipitated with saturated baryta-water; the resulting barium saponate, after washing with baryta-water, was suspended in water and decomposed by a current of carbonic anhydride, then heated to the boiling point, and filtered; the filtrate, evaporated to a syrup at a gentle heat, was precipitated with alcohol; and the still yellowish saponin was further purified with alcohol of 90 per cent. The substance thus obtained still contained barium salts, to remove which it was dissolved in water and treated with dilute sulphuric acid, added drop by drop; and the filtered liquid, after concentration at a gentle heat, was precipitated with alcohol and ether, these operations being repeated a second and a third time, and the product finally purified with boiling alcohol of 90 per cent. in quantity not sufficient to dissolve it completely. The alcoholic solution evaporated in a vacuum left perfectly white flocks of pure saponin, which were washed with ether and dried over sulphuric acid.

Saponin thus prepared gave, as the mean result of five analyses, 52.65 per cent. carbon and 7.36 hydrogen, agreeing nearly with the formula $C_{33}H_{54}O_{18}$, which requires 52.86 C and 7.44 H. Saponin from *Gypsophila* was found by Rochleder to contain 52.65 carbon and 7.34 hydrogen.

Pure saponin is a very white, amorphous, inodorous powder, which excites sneezing when inhaled by the nostrils; it has a pungent disagreeable taste, and is poisonous; dissolves very freely in water, but is insoluble in ether, benzene, and chloroform, and only

slightly soluble in alcohol. Heated on platinum-foil it decomposes, emitting an odour of burnt sugar, and leaving a porous residue difficult to burn. Saponin is lævogyrate, like most glucosides; specific rotatory power $[\alpha]_D = -7.30$; it is the least optically active of all known glucosides.

The remainder of the author's paper deals with decomposition-products of saponin.

Improved Method for Preparing Sclerotic Acid, the Active Principle of Ergot. Dr. Podwissotzky. (From *New Remedies*.) Four hundred grams of powdered ergot are heated for three or four hours on a steam-bath, with one litre of distilled water and sixty grams of diluted (1:7) sulphuric acid, then pressed, and the residue again extracted with 500 c.c. of distilled water for two hours in the same manner. The liquid is expressed, united with the first, the whole heated to 70°C . (158°F .), and treated with neutral acetate of lead until this ceases to yield a precipitate. This reagent throws down the erythrosclerotin as an insoluble violet lead compound. (Erythrosclerotin yields precipitates with metals, earths, and alkaline earths; if freed from these substances, it is soluble in alcohol, with red colour. After an extract of ergot has been freed from erythrosclerotin, it no longer gives a precipitate with acetate of lead.)

After the liquid, together with the precipitate, has been warmed for one hour more on the water-bath, it is filtered, and the excess of lead removed from the filtrate by hydrosulphuric acid. The sulphide of lead having been separated by filtration, the straw-yellow liquid is evaporated on a water-bath (if at all possible, in a vacuum apparatus) to a syrupy consistence (to about 150 c.c.) or better still until a coffee-brown colour shows itself at the margin of the residue in the dish. (This is a sign of the beginning decomposition of the sclerotic acid; the dark colour, when once produced, cannot be removed.)

The residue is now briskly stirred up and mixed with $1\frac{1}{2}$ litre of absolute alcohol, whereupon the sclerotic acid will separate in ten or twelve hours. The alcohol is then poured off, another half litre of absolute alcohol poured on, with which the mass is thoroughly kneaded in a mortar. Finally, it is removed and dried over caustic lime and sulphuric acid. By repeated kneading and working with absolute alcohol, the product may be rendered dry enough to be reduced to powder.

The yield is from twelve to fourteen grams, and the sclerotic acid thus obtained is best preserved over lime and sulphuric acid.

Or the product may be preserved in absolute alcohol, and may also be transported or shipped in the latter.

The product is quite light-coloured, not deeper than gum arabic, but it cannot be obtained entirely free from calcium and potassium salts.

While Bonjean's as well as Wernig's ergotin, when used hypodermically, may produce irritation or inflammation of the connective tissue, the latter does not occur with sclerotic acid. However, a solution of the last-named does not keep long, and to obviate this, some have been in the habit of combining it with salicylic acid. This being, however, but little soluble, and sometimes separating in form of fine needles, which themselves may cause irritation, Dr. Podwissotsky recommends to use thymol water (1:1000) for solution. In this form the remedy has been used successfully in the insane asylum at Dorpat, and is also commonly dispensed by the pharmacists of the city.

When treated with alkalis or alkaline earths, sclerotic acid *loses its effects completely*, a gum-like body being then formed, while ammonia is given off.

Chrysophanic Acid. (*Pharm. Journ.*, 3rd series, xiv. 69. From *New Remedies*.) This paper is a brief summary of the literature of chrysophanic acid from a chemical and therapeutical point of view. As it is not suited for abstraction, reference should be made to the source quoted.

Derivatives of Opianic Acid. R. Wegscheider. (*Monatsh. Chem.*, iv. 262-271.) The author has studied the action of heat and that of bromine on opianic acid, and has thus obtained a number of derivatives which are fully described in this paper. Reference should be made to the original, as the paper is not suited for abstraction.

Cinnamic Acid Derivatives. E. Erlenmeyer and A. Lipp. (*Liebig's Annalen*, ccxix. 179-233.) The authors, in the course of their investigation on the synthesis of tyrosine, prepared and examined several derivatives of cinnamic and phenyllactic acids. As the paper is not suited for useful abstraction, reference should be made to the original.

New Synthesis of Cinnamic Acid. A Michael. (*Amer. Chem. Journ.*, v. 205.) A satisfactory yield of cinnamic acid is obtained by heating malonic acid and benzaldehyde, in molecular proportions, in a sealed tube at 140° for several hours.

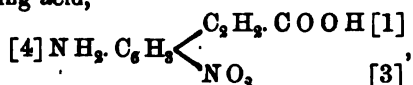
Derivatives of Cinnamic and Hydrocinnamic Acids. S. Gabriel and M. Herzberg. (*Ber. der deutsch. chem. Ges.*, xvi. 2036-2043; *Journ. Chem. Soc.*, 1883, 1123.)

Orthochlorocinnamic acid, $C_6H_4Cl.C_2H_3.COOH$, prepared by the action of hydrochloric acid on orthodiazocinnamic acid, forms golden crystals, melting at 200° , soluble in alcohol and ether, insoluble in water; *orthochlorhydrocinnamic acid*, $C_6H_4Cl.C_2H_4.COOH$, crystallizes in needles melting at 96.5° . The corresponding *iodocinnamic acid* is a crystalline solid melting at $212-214^\circ$, the *iodohydrocinnamic acid* forms leaflets melting at 102° ; it is slowly converted into hydrocinnamic acid by nascent hydrogen.

Metachlorocinnamic acid forms golden needles melting at 167° , soluble in hot alcohol and ether; *metachlorhydrocinnamic acid* crystallizes in leaflets. The corresponding *iodocinnamic* and *iodohydrocinnamic acids* melt at 181° and 65° respectively.

Parachlorocinnamic acid does not crystallize in a well-defined form; it melts at 241° , is sparingly soluble in cold water, readily in alcohol; *parachlorhydrocinnamic acid* melts at 124° ; and the corresponding *iodocinnamic* and *iodohydrocinnamic acids* at 255° and 140° respectively.

Paracetamidocinnamic acid, $NH\overline{Ac}.C_6H_4.C_2H_3.COOH$, crystallizes in long colourless needles melting at 259° ; soluble in hot alcohol, insoluble in ether. Dinitroacetamidostyrole, $NH\overline{Ac}.C_6H_3(NO_2)_2.C_2H_3$, obtained by the action of nitric acid on the above compound, crystallizes in needles melting at 211° . If the nitration be effected in the cold, an impure nitroparamidocinnamic acid is formed, which on boiling with sodium hydroxide yields sodium mononitroparamidocinnamate. By the action of hydrochloric acid, the corresponding acid,



is obtained in red needles melting at 224.5° , and soluble in hot alcohol, less soluble in water; as this substance yields metanitrocinnamic acid when boiled with ethyl nitrate, the nitro-group is in the meta-position to the $C_2H_3.COOH$ group. *Metaparadiamidocinnamic acid*, obtained by the reduction of the above nitro-acid, crystallizes in golden needles melting at 167° , soluble in water and alcohol, insoluble in ether and benzene.

Bromacetamidostyrole, $[4]NH\overline{Ac}.C_6H_3Br.C_2H_3 [1]$, formed by the action of bromine on paramidocinnamic acid, crystallizes in needles melting at 182.5° , insoluble in ammonia, soluble in alcohol and ether.

A Contribution to the Knowledge of Quinovic Acid, Quinovine, and Quinovite. A. C. Oudemans. (*Archives Neerlandaises des*

Sciences Exactes et Naturelles, xviii. Part 4; *Chemical News*, xlix. 22.) The author's observations upon α -quinovine agrees with those of MM. Liebermann and Giesel. This compound, under the influence of acids, is split up into quinovic acid and a kind of sugar, which the author calls quinovite. He has not been able to confirm Rochleder's observation that the same decomposition is effected by sodium amalgam. The author considers that the composition of quinovic acid is best expressed by the formula, $C_{33}H_{52}O_6$. Quinovite is not identical with mannite, as Berthelot assumes. Its composition may be provisionally stated as $C_6H_{12}O_4$. It is dextro-rotatory, and is very easily oxidized by nitric acid, with abundant formation of oxalic acid. Amongst the products formed by the action of sulphuric acid upon quinovic acid was a small quantity of a compound, probably identical with the quino-chromine of Liebermann and Giesel, and on one occasion there was found a very small quantity of a hydrocarbon, which the author calls quinovine. Another product obtained from the alcoholic mother-liquor of quino-chromine is apo-quinovic acid, to which the author ascribes the formula $C_{18}H_{26}O_4$.

Quinovin and Quinovic Acid. C. Liebermann and F. Giesel. (*Ber. der deutsch. chem. Ges.*, xvi. 926.) The authors have endeavoured to throw some light upon the chemical nature and formulæ of quinovin, its compounds and decomposition products.

From the general results of the analyses, the authors are inclined to represent quinovin and some of its compounds by the following formulæ:—

Quinovin	$C_{28}H_{42}O_{11}$
Quinovin Alcohol Compound	$C_{28}H_{42}O_{11} + 5C_2H_6O$
Quinovic Acid	$C_{33}H_{52}O_6$
Pyroquinovic Acid	$C_{23}H_{40}O_4$

But some of the analytical results agree nearly as well with formulæ containing another atom of carbon, and at present the authors prefer to leave the question open.

Chelidonic Acid. A. Lieben and L. Haitinger. (*Monatsh. Chem.*, iv. 273–275 and 339, 340. From *Journ. Chem. Soc.*) Chelidonic acid, when heated to boiling with solutions of the alkalis or alkaline earths, is completely resolved into acetone and oxalic acid, according to the equation, $C_7H_4O_6 + 3H_2O = 2C_2H_2O_4 + C_3H_6O$. The acid appears to be dibasic, the neutral tribasic salts of Lerch and the basic salts of Lietzenmeyer being in reality salts of an acid derived from chelidonic acid by addition of the elements of water,

and distinguished from it by giving yellow precipitates with lead and silver salts, and a yellowish red coloration with ferric chloride; whilst chelidonic acid gives white precipitates with lead and silver salts, and a brown coloration with ferric chloride only after long standing. The above-mentioned yellow lead salt has the composition $\text{Pb}_2 \text{C}_7 \text{H}_2 \text{O}_7 + \text{H}_2 \text{O}$. By treatment with zinc and acetic acid, chelidonic acid yields a crystalline acid, melting at 140° . The authors suggest the expression, $\text{COOH} \cdot \text{C} \begin{array}{c} \parallel \\ \text{C} \end{array} \text{H} \cdot \text{C} \begin{array}{c} \parallel \\ \text{C} \end{array} \text{O} \cdot \text{CH}$

as possibly representing the constitution of chelidonic acid.

By the action of ammonia on chelidonic acid, Lietzenmeyer obtained an acid of the formula $\text{C}_7 \text{H}_7 \text{NO}_6$, termed by the authors *ammonchelidonic acid*. Treated with bromine in presence of water it yields a tribasic crystalline dibromo-acid, which gives a purple coloration with ferric chloride; it probably contains only two carboxyl-groups. The author considers it probable that the nitrogen atom in ammonchelidonic acid is exclusively in union with carbon.

Ammonchelidonic acid when heated with water at 195° , or by dry distillation, is completely resolved into carbonic anhydride, water, and *hydroxypyridine*, $\text{C}_5 \text{H}_5 \text{NO}$; this separates from aqueous solution in fine efflorescent crystals containing water of crystallization, has a neutral reaction, but yields a hydrochloride and platinum-chloride; when distilled with zinc-dust it yields pyridine.

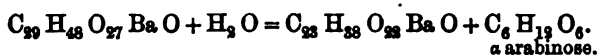
Dibromhydroxypyridine, $\text{C}_5 \text{H}_3 \text{Br}_2 \text{NO}$, is obtained by the action of bromine on hydroxypyridine, or by heating the brominated chelidonic acid. It is crystalline, sparingly soluble in water, insoluble in dilute acids, readily soluble in alkalies, from which solutions it is precipitated unaltered on addition of acids. It dissolves in concentrated hydrochloric acid, and yields with platinum chloride the crystalline *platinochloride*, $(\text{C}_5 \text{H}_3 \text{Br}_2 \text{O})_3, \text{H}_2 \text{Pt Cl}_6$. An ammoniacal solution gives with silver nitrate a heavy, crystalline, sparingly soluble silver compound. It is very probably identical with the dibromhydroxypyridine which Hofmann obtained by the action of bromine on piperidine.

A New Acid in Beet Juice. E. O. Lippmann. (*Ber. der deutsch. chem. Ges.*, xvi. 1078–1081.) Besides citric, aconitic, tricarballic, and malonic acids, the author has isolated a tribasic acid of the formula $\text{C}_6 \text{H}_5 \text{O}_8$. It is very readily soluble in water, alcohol, and ether. The alkali salts are amorphous and very readily soluble. The *barium* salt, $(\text{C}_6 \text{H}_5 \text{O}_8)_2 \text{Ba}_3 + 5 \text{H}_2 \text{O}$, is insoluble in water and in alcohol. The *calcium* salt has the formula

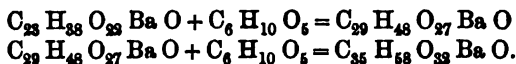
$(C_6H_5O_8)_2Ca_3 + 10H_2O$. Pawolleck obtained an acid (hydroxy-citric acid) of the same formula by boiling chlorocitric acid with water or alkalies; this acid agrees in its properties with that obtained from beet-juice, the calcium salt, however, containing, according to Pawolleck, 9 mols. H_2O . The author assumes the two to be identical.

Arabic Acid: its Composition and the Products of its Decomposition. C. O'Sullivan. (*Pharm. Journ.*, 3rd series, xiv. 514.) The author, wishing to compare arabic acid with other bodies with which he was working, looked up the literature of the subject, but found the results obtained by previous observers so irreconcilable that he was forced to examine this substance for himself. The present paper contains the first results of this examination. The author has mainly followed the method employed by Neubauer. The gum is dissolved in the smallest possible quantity of water, and the solution decanted from any insoluble matter; twice or three times as much hydrochloric acid as is sufficient to convert the bases into chlorides is added, and the arabic acid then precipitated by an excess of alcohol. The curdy precipitate is washed with alcohol and pressed; it is then dissolved in boiling water, cooled, and alcohol gradually added, with constant stirring. The liquid becomes milky, but no precipitate forms; a few drops of hydrochloric acid are added, when a curdy precipitate is produced. By the careful addition of hydrochloric acid the body can be precipitated in several successive portions. The author obtained four such precipitates; each portion was redissolved and reprecipitated several times, dehydrated with absolute alcohol, pressed, and dried over sulphuric acid. Thus treated the bodies are white, friable, soluble in water, and free from ash. By an optical examination, and the analysis of their barium salts, the author proved that he was dealing with an homogeneous body, the optical activities ranging from $[\alpha]_D - 25.7$ to 27.0 , and the percentage of barium oxide from 5.90 to 6.07 . It occurred to the author that a careful study of the action of sulphuric acid might throw some light on the nature and composition of arabic acid, and that this body should yield a sugar or sugars, and a series of acids of gradually diminishing molecular weight; i. e. fact, that it would behave after the manner of starch (*Journ. Chem. Soc.*, 1876, ii. 125). Five hundred grams of arabic acid $[\alpha]_D - 27^\circ$, which must be free from ash, were dissolved to 1,500 c.c., and 40 grams of sulphuric acid in 150 c.c. of water added. The mixture was boiled for three hours, cooled, and exactly neutralised with a hot solution of barium hydrate. The barium sulphate was filtered off,

the filtrate evaporated to 1,000 c.c., and alcohol of specific gravity ·83 added as long as a precipitate fell. This waxy precipitate was repeatedly dissolved in water, reprecipitated by alcohol to free it from sugar, and dried over sulphuric acid. This white, friable body when dried at 100° gave 14·57 Ba O. The arabic acid molecule had, therefore, broken up. It remained to be proved whether the substance was homogeneous or not. It was dissolved in water and fractionally decomposed by successive additions of sulphuric acid, into three portions, *A*, *B*, and *C*. *A* contained 14·27 per cent. Ba O; *B*, 14·35 per cent.; *C*, 15·46 per cent. Portion *C* was further separated into three: the 1st contained 15·27 Ba O; 2nd, 15·36 per cent.; 3rd, 15·54 per cent. It was, therefore, fairly homogeneous. *A* and *B* were mixed, and on fractionation it became evident that there were two salts, one containing 13·3 to 13·4 per cent. Ba O, the other 15·5 per cent. Ba O. The author then studies the further action of sulphuric acid on this 15·5 per cent. barium salt. Twenty grains were dissolved in water, and 2·5 c.c. of sulphuric acid previously diluted with water added, the mixture was digested for three hours at 100°; by neutralization and treatment as above, a salt was obtained containing 18·5 per cent. Ba O. This salt was submitted to combustion, it gave numbers indicating the formula $C_{33}H_{38}O_{32}BaO$; it is therefore not a carbohydrate, but differs from the carbohydrate, $C_{24}H_{40}O_{20}$, by the subtraction of CH_2 and addition of O_3 . The alcoholic solution from which this salt had been separated was freed from alcohol, the residue concentrated to a syrup, purified, and allowed to crystallize, when a sugar of the class $C_6H_{12}O_6$ separated out; its optical activity was $[\alpha]_D^{20}$ 79–81° and copper reducing power $K = 81 - 82$. The salt containing 15·5 per cent. Ba O was next dried and analysed; it gave a formula $C_{39}H_{48}O_{27}BaO$. The 18·5 per cent. Ba O salt was doubtless, therefore, derived as follows:—



The 13·3 barium salt corresponds to the formula $C_{35}H_{58}O_{32}BaO$; so that we have the series—

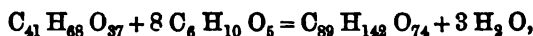


The high molecule being broken down with elimination of $C_6H_{10}O_5$, which is hydrated to a sugar of the $C_6H_{12}O_6$ class, it appeared probable that the arabic acid molecule was broken down in the same

way, and that its composition would be arrived at by adding such a multiple of $C_6 H_{10} O_5$ to one of these barium salts as would give a compound containing the same quantity of Ba O as barium arabate. To obtain further evidence of this disintegrating process, 200 grams of pure arabic acid $[\alpha]_D - 27^\circ$ were dissolved in 300 c.c. of water, to which 10 grams of sulphuric acid were added, and the whole was digested at 100° for one hour. The product was separated as before by fractional precipitation, and eventually two salts obtained containing 11.35 per cent. Ba O and 13.38 per cent. Ba O. The latter was the salt already noticed, $C_{35} H_{58} O_{33} Ba O$. The 11.35 per cent. salt was analysed and gave a composition, $C_{41} H_{68} O_{37} Ba O$.

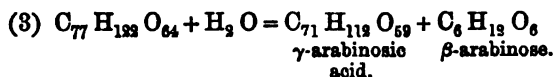
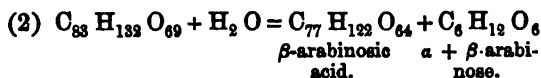
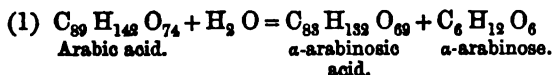


The free acid of this salt was also prepared; its analysis confirmed the above formula. At this point the author set to work to isolate the sugars which ought to be separated at the various steps of the disintegration of the molecule of arabic acid. Starting with the alcoholic solution from which the salt $C_{29} H_{48} O_{37} Ba O$ had separated, he succeeded in obtaining three sugars of the $C_6 H_{12} O_6$ class, which he names β -arabinose $[\alpha]_D = 111.1^\circ K$ 110; γ -arabinose, $[\alpha]_D = 91^\circ K = 99.4-100$; and δ -arabinose $[\alpha]_D = 79-81^\circ K$ 81-82, and in proving the presence of α -arabinose with a greater optical activity than β -arabinose. The author then gives the results of six analyses of arabic acid; the numbers lead to the empirical formula, $C_6 H_{10} O_5$. Now a barium salt containing CH O in this ratio, and at the same time 6 per cent. Ba O, should be $C_{90} H_{160} O_{75} Ba O$, but such a constitution does not lead to the highest acid, $C_{41} H_{68} O_{37}$, obtained in the decomposition products; thus $C_{41} H_{68} O_{37} + 8 C_6 H_{10} O_5 = C_{89} H_{148} O_{77}$, but writing the equation thus—

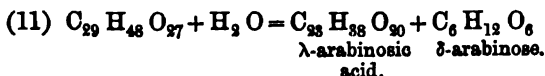
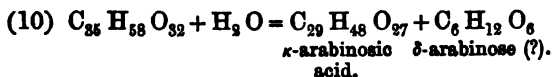
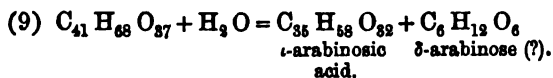
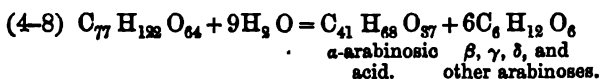


we obtain a formula for arabic acid, $C_{89} H_{148} O_{74}$, which fits exactly with the combustion percentages, and requires 6 per cent. Ba O, the numbers obtained being 6.10, 5.90, 6.00, 6.16. The calcium salt was prepared and gave similar results. Arabic acid may therefore be represented by $C_{89} H_{148} O_{74}$. Finally the author made a successful attempt to isolate the acids intermediate between arabic acid and the $C_{41} H_{68} O_{37}$ acid. Sixty grams of pure arabic acid were dissolved in 200 c.c. of water containing 4 grams of sulphuric acid, and digested for fifteen minutes at $100^\circ C$. Two barium salts were obtained, containing 6.45 per cent. Ba O and 7.36 per cent., corresponding respectively to $C_{83} H_{133} O_{69} Ba O$ and $C_{71} H_{119} O_{59} Ba O$:

β -arabinose, α_j 111.5° K 110, was also isolated, and evidence obtained that α -arabinose α_j 140° was present. Neither γ - nor δ -arabinose was detected. The author then gives a summary of this most important paper respecting the decomposition of arabic acid by sulphuric acid:—



The next five steps have not been followed, and so are united.



This last arabinosic acid, $\text{C}_{23} \text{H}_{38} \text{O}_{20}$, is a very stable body, resisting the action of 3 per cent. to 4 per cent. solution of sulphuric acid for many hours. It probably splits up in a more complicated way than its predecessors. Arabic acid, α_j -27° to -28°, is the chief constituent of all the lævorotatory gums; other acids are present, which bear a simple relation to it. In a future paper, the author promises an account of the dextrorotatory and optically inactive gums, the acids of which are built up in the same manner as arabic acid.

Studies in the Chemistry of Tartaric Acid. B. J. Grosjean. (*Journ. Soc. Chem. Ind.*, August 29, 1883.) A lengthy report dealing with the following subjects:—

1. Action of Solutions of Potassium and Sodium Sulphate on Calcium Tartrate.
2. Destruction of Citrates and Tartrates by Hydrogen Peroxide.

3. Destruction of Neutral Tartrates when their Solutions are heated with an Iron Salt.
4. Determination of Free Sulphuric Acid in Tartaric Acid Liquors.
5. Determination of Tartaric Acid by Precipitation as Potassium Bitartrate.
6. Detection of Tartaric Acid in Citric Acid.
7. Determination of Organic Acids from the Neutralizing Capacity of the Ash of their Salts.
8. Standardizing of Alkali used for Titration.

For details reference must be made to the original paper, which is not suited for abstraction.

Preparation of Lactic Acid. H. Kiliani. (*Pharm. Journ.*, 3rd series, xiv. 130.) The author recommends the following process:—500 grams of cane sugar are heated to 50° for three hours, with 250 c.c. of water and 10 c.c. of sulphuric acid, in a flask holding about 2 litres. To the colourless or at most faintly yellow solution of invert sugar is added, after cooling, 400 c.c. of a caustic soda solution (containing 1 part Na H O in 1 part H₂ O), in quantities of 50 c.c. at a time. This ley at first forms a slimy layer at the bottom, and a fresh portion is not added until a homogeneous mixture has been promoted by agitation. The flask is judiciously cooled by cold water during the addition of the soda ley. The mixture easily becomes coloured, and if the alkali be rashly added, the development of heat is so great as almost to cause the fluid to boil. In this way the amount of the yield, indeed, is not particularly affected, but highly-coloured products are formed, and the zinc salt subsequently obtained is by no means pure. Lastly, the mixture is heated to 60° or 70°, until a sample, heated to boiling with Fehling's solution, causes no separation of cuprous oxide, and only a green tint. The calculated quantity of sulphuric acid (obtained by mixing 3 parts of sulphuric acid with 4 parts of water and standardizing by titration with soda solution used) is allowed to flow into the cooled mixture. As soon as the acid fluid is at the ordinary temperature, a crystal of Glauber's salt is dropped in, and the flask is immersed in cold water until a thin crystalline crust has formed on the sides. This is loosened by violent shaking. The cooling and shaking are continued until further formation of crystals ceases. The mixture is now allowed to stand aside for from twelve to twenty-four hours, until the contents of the flask appear as a cake of crystals saturated with a reddish fluid. Alcohol of 90 per cent. strength is now added, the mixture being shaken meanwhile, until

no further precipitation takes place. The separated Glauber's salt is thrown on to a suction filter, and completely washed with a little more alcohol. One half of the filtrate is neutralized with zinc carbonate, on the water-bath, filtered while boiling hot, and mixed with the other half. On cooling, crystallization commences at once, as a rule, and is finished when the solution has stood for about thirty-six hours. The lactate of zinc so obtained can be easily freed from the mother-liquor by decantation, and especially by hard pressure, so that it is pure after once recrystallizing. The weight of the crystals obtained amounts to thirty or forty per cent. of the sugar used, and the concentrated mother-liquor yields a further quantity of zinc salt. Should a small portion of the mother-liquor of the second crystallization, on shaking with ether, yield to the latter free lactic acid, half of the solution is again boiled with excess of zinc carbonate, in order to obtain more crystals on the addition of the other half of the filtrate.

Free Fatty Acids in Vegetable Oils. E. Schmidt and H. Römer. (*Archiv der Pharm.*, 1883; *From Pharm. Journ.*, 3rd series, xiv. 130.) The authors show that free fatty acids occasionally occur in larger or smaller quantities as constituents of normal vegetable oils.

The oil contained in the seeds and seed-vessels of *Cocculus indicus* consists chiefly of free stearic acid and small quantities of other fatty acids rich in carbon. The oil of commerce is in fact nearly pure stearic acid. "Nutmeg butter" contains from 3 to 4 per cent. of free myristic acid, and a small quantity of another acid, perhaps identical with stearic. The oil obtained by extracting dried laurel berries with hot alcohol, distilling off the alcohol, and washing the residue with hot water, exhibits a perceptible amount of free fatty acids, which cannot be separated from one another, but probably consist partly of palmitic acid.

Tannin from Oak Bark. C. Böttinger. (*Ber. der deutsch. chem. Ges.*, xvi. 2710-2713.) The author arrives at the conclusion that the tannic acid from oak bark is a condensation-product of an aldehyde, $C_2H_5.CO.CH_2.CHO$, with tannin.

The Tannins of Oak Bark. C. Etti. (*Monatsh. Chem.*, iv. 512-530; *Journ. Chem. Soc.*, 1883, 994.) The tannin of oak bark exists in two forms, viz., as a tannic acid, which in the free state has a reddish white colour, and as an anhydride of that acid, called *phlobaphene*, the colour of which is brown-red. The distinction between these two bodies is familiar to tanners, who designate the anhydride simply as "colouring matter," and reject barks contain-

ing a large proportion of it, as it imparts too red a colour to leather dyed with such barks.

The question as to the existence of a glucoside in oak bark is now decided in the negative, as tannic acid extracted from the bark by ethyl acetate does not yield any such substance. The reactions which were supposed to indicate the presence of a glucoside, were really due to levulin, which, on treating the bark with dilute sulphuric acid, was converted into levulose.

The tannic acid obtained by agitating an alcoholic extract of the bark with ethyl acetate may be contaminated with two substances, a brownish green, amorphous terpene-resin and phlobaphene. The former may be separated by its ready solubility in ethyl acetate, ethyl oxide, and benzene. The phlobaphene is easily recognised by the brown-red precipitate which it gives with lead acetate.

Quercitannic acid cannot be extracted from the bark in the pure state by ethyl acetate, inasmuch as it decomposes that compound into alcohol and acetic acid almost as easily as sulphuric or hydrochloric acid, and the acetic acid thus set free dehydrates a portion of the tannic acid, producing phlobaphene. Pure quercitannic acid dissolves completely in ethyl acetate, and does not give up any foreign bodies to pure ethyl oxide or to benzene; its solution in very dilute alcohol gives with basic lead acetate a precipitate of pure yellow colour.

Phlobaphene is nearly insoluble in water and in ether, but dissolves readily in alcohol of all strengths. As prepared from the bark, it may be contaminated with terpene-resin and pectin substances. The former of these bodies may be recognised and separated by treatment with ether or benzene, which dissolve it; the pectin substances by their insolubility in spirit of 90 per cent. The presence of tannic acid in the phlobaphene may be recognised by the fact that the latter, after being freed from adhering moisture by drying at 110° , gives off a further quantity of water at $130-140^{\circ}$.

Quercitannic acid is represented by the formula, $C_{17}H_{16}O_9$. At $130-140^{\circ}$ it gives off water, and is converted into the brown-red anhydride, $C_{34}H_{30}O_{17} = 2 C_{17}H_{16}O_9 - H_2O$, identical with the phlobaphene contained in the bark. 1 mol. of this substance boiled with sulphuric or hydrochloric acid gives up 1 mol. water, and is converted into a second anhydride, $C_{34}H_{28}O_{16}$; and by boiling the tannic acid free from anhydrides with either of these anhydrides, a third anhydride, $C_{34}H_{26}O_{15}$, is obtained. These three anhydrides are soluble in alcohol and in caustic alkalis. Löwe, by treating quercitannic acid or phlobaphene with dilute sulphuric acid, or

with oxalic acid, has obtained a fourth anhydride, $C_{34}H_{24}O_{14} = 2C_{17}H_{12}O_9 - 4H_2O$, which he designates as *oak-red*. The same name has been applied to the first anhydride by Oser, and to the second by Böttiger.

Another oak bark examined by the author yielded a tannic acid having the composition $C_{30}H_{20}O_9$, and agreeing with the former in all its properties, excepting in its reaction with ferric chloride, with which it gives a bluish green colour, quickly changing to deep green, and, on addition of sodium carbonate, first to blue and then to red; whereas the quercitannic acid above described, and all its anhydrides, give with ferric chloride a black-blue precipitate. This tannic acid begins to lose water at 124° , melts at 140° , resolidifies on further loss of water, and is converted into a brown-red substance, identical in composition with phlobaphene.

The tannic acid, $C_{30}H_{20}O_9$, also yields four anhydrides agreeing in character with those obtained from the acid $C_{17}H_{12}O_9$. These anhydrides are represented by the formulæ, $C_{40}H_{32}O_{17}$, $C_{40}H_{36}O_{16}$, $C_{40}H_{34}O_{15}$, and $C_{40}H_{33}O_{14}$. The same tannic acid heated in a sealed tube with hydrochloric acid yielded a gas burning with a green flame, but smaller in quantity than that obtained from the acid $C_{17}H_{12}O_9$. Heated in a tube with dilute sulphuric acid, it gave a red liquid and a large quantity of undissolved anhydrides; and on agitating this liquid with ether, a small quantity of crystals was obtained consisting of gallic acid.

The phlobaphene submitted to dry distillation, yielded pure catechol, free carbon, and an oil insoluble in potash, smelling like the terpenes, and containing 72.46 per cent. C and 7.11 H. This oil, oxidized with permanganate, yielded an amorphous resin, whence the author concludes that it is derived, not from the tannin, but from the terpenes mixed with the phlobaphene which was submitted to dry distillation.

For the theoretical considerations relating to the constitution of all the bodies above described, the original paper must be consulted.

Preparation of Glycollic Acid from Glycerin. H. Kiliani. (*Ber. der. deutsch. chem. Ges.*, xvi. 2414.) The author has already shown that several glucoses and nearly allied compounds yield glycollic acid when oxidized by silver oxide, and has recommended the oxidation of inverted sugar as a method for preparing this compound (*Annalen*, ccv. 191.) The acid can, however, be more easily obtained by oxidizing glycerin with silver oxide in presence of an alkali. For this purpose 10 grams of glycerin are mixed with 200 c.c. of water and 6 grams of slaked lime added, to this

the oxide of silver obtained from 60 grams of silver nitrate is next added, and the whole heated at 60° for some four hours. The product is treated with carbonic anhydride, and filtered; on concentrating the filtrate, calcium glycolate separates out.

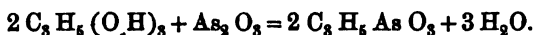
Physical Characters of Nitro-Glycerin. M. Hay. (*Pharm. Journ.*, 3rd series, xiv. 8.) In view of the extended use of nitro-glycerin in therapeutics, the author supplies the following observation on its physical characters.

Nitro-glycerin is perfectly colourless, and not of a clear yellow colour as is stated in most of the papers on the chemistry of this body. The colour is due to the imperfect removal of the acid, or to the use of soda, which is commonly used for washing it, and which decomposes it with the production of a reddish brown colour. It has no odour when cold, but has a sharp, pungent odour when heated. Its taste is sweet, and not unlike that of glycerin, but is more pungent. As regards its solubility: 1 gram dissolves in about 800 c.c. of water; with difficulty in 3 c.c. of absolute alcohol, easily in 4 c.c.; in 10.5 c.c. of rectified spirit (sp. gr. 0.846); in 1 c.c. of methylic alcohol (sp. gr. 0.814); in 4 c.c. of methylated spirit (sp. gr. 0.830); in 18 c.c. of amyllic alcohol; in every proportion in ether; so also in chloroform, in glacial acetic acid, and in carbolic acid; in less than 1 c.c. of benzol; in 120 c.c. of carbon bisulphide; and to a very limited extent, if at all, in glycerin. Its solutions in water and alcohol the author has kept for nearly four months without their exhibiting the slightest evidence of decomposition; and he has no reason for believing that they will not remain undecomposed for a much longer time.

The Action of Arsenious Anhydride on Glycerin. H. Jackson. (*Chemical News*, xlix. 258.) It is well known that glycerin is the best solvent for arsenious anhydride, but the reason of this seems never to have been pointed out. The author found that a considerable quantity of water was given off when anhydrous glycerin was treated with dry As_2O_3 , and directed his attention in the first place to the determination of the amount of water evolved when a weighed quantity of glycerin was treated with excess of As_2O_3 . Some preliminary experiments had shown that the As_2O_3 would be insufficient excess if used in the proportion of 1.5 parts of As_2O_3 to 1 part of glycerin. The author found considerable difficulty in obtaining constant results in the determination of the water; but the mean of several experiments (viz. 25.5 grams of glycerin gave 8.2 grams of water), indicated that the amount of As_2O_3 required to saturate the glycerin was at least equal in weight

to the glycerin employed. The next experiments were arranged to determine the maximum quantity of As_2O_3 which could be made to combine with glycerin. For this purpose different proportions of glycerin and As_2O_3 were taken and placed in stout hard glass tubes, the ends of which were then sealed, and the tubes with their contents were heated in an air-bath for two hours at a temperature of 250°C .

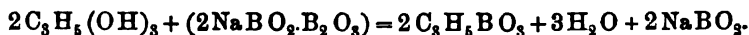
It was found that in all cases where the amount of As_2O_3 had been greater than that indicated by the previous experiments (viz., 1 part of As_2O_3 to 1 part of glycerin), some of the As_2O_3 crystallized out as the tubes cooled. Some blackening of the contents was noticed in each instance; this was found on examination to be due to arsenic from reduction of a little As_2O_3 . After these experiments, the author made some more determinations of the amount of water evolved when a weighed quantity of glycerin was treated with As_2O_3 , and of the weight of As_2O_3 required to fully saturate it. The mean of these experiments gave the following result:—14.45 grams of glycerin required for saturation 15.98 grams of As_2O_3 , and gave off 4.57 grams of water, or nearly; 184 parts (2 equivalents) of glycerin require 198 parts (1 equivalent) of As_2O_3 , and evolve 54 parts (3 equivalents) of water, represented by the equation,—



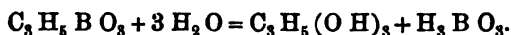
The mean of the analyses of the products obtained in the last experiments gave the following result:—0.2121 gram of the compound contained 0.1225 gram of As_2O_3 ; 0.2121 gram of $\text{C}_3 \text{H}_5 \text{AsO}_3$ contains theoretically 0.125 gram of As_2O_3 . These experiments prove that As_2O_3 and glycerin react together to form normal glyceryl arsenite, or the arsenious ether of glycerin, in the manner represented by the above equation. This compound is a colourless, transparent, vitreous solid, very deliquescent, and easily decomposed by water into glycerin and As_2O_3 . It is entirely soluble in absolute alcohol, and is left unchanged when the alcohol is driven off by evaporation. It is also freely soluble in glycerin, as would be expected. It becomes soft at 100°C ., and can be poured easily when the temperature reaches 200°C . When quite dry it appears to be stable at the boiling point of glycerin, 290°C ., but is decomposed above that temperature.

The Action of Some Polyhydric Alcohols upon Borax. W. R. Dunstan. (*Pharm. Journ.*, 3rd series, xiv. 41.) The author's paper deals with the action upon borax of glycerol, mannitol,

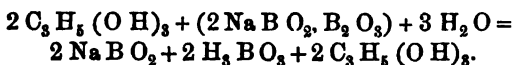
dextrose, and levulose, and is supplemented by a report on the chemistry of *Mel Boracis*. The chief results of the experiments described in the first part of the paper, tend to show that polyhydric alcohols decompose sodium pyroborate with the formation of sodium metaborate and a boric ether, or, if water be present, free boric acid. Besides these a number of secondary reactions seem to be involved. The principal properties of these bodies are described, but whether they are mono-, di-, or tri-borins, has not directly been determined. In the case of glycerol, however, there can be little doubt that the substance produced is glycerol in which all the three hydroxyl groups are substituted by the boric radical ($C_3H_5BO_3$). The following equations symbolize the action of glycerol upon sodium pyroborate and other similar polyhydric alcohols:—



But inasmuch as water itself is a product of the decomposition, the above reaction is never complete save at high temperatures, owing to the conversion or partial conversion of the borin into boric acid under the influence of the water, thus—



In aqueous solutions the reaction may be thus represented in one equation—



This is a reaction, which, taken by itself, might be attributed to what has been called "catalysis," for the glycerin remains unchanged at the close of the reaction. However, the production of a boric ether as the determining cause of this reaction, affords a much more satisfactory explanation.

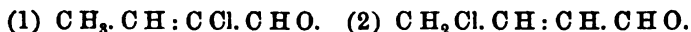
Not only are the results of this investigation interesting on the side of the polyhydric alcohols, but also as additional evidence in favour of regarding anhydrous borax as a sodium pyroborate; that is, a compound of boric anhydride with sodium metaborate.

Chlorophenols. T. Chandelon. (*Ber. der deutsch. chem. Ges.*, xvi. 1749-1753.) The author describes a number of chlorophenols produced by the action of sodium hypochlorite on a 3 per cent. solution of phenol. For details reference must be made to the original article.

Acetone-Chloroform. C. Willgerodt. (*Ber. der deutsch. chem. Ges.*, xvi. 1585.) This compound, previously described by

the author, contains half a molecule of water of crystallization, C O Me_2 , $\text{C H Cl}_3 + \frac{1}{2} \text{H}_2 \text{O}$, and melts at $80-81^\circ$. On treating it with anhydrous solvents, such as chloroform, light petroleum, benzene, and carbon bisulphide, it loses its water of crystallization, and then melts at 96° .

The Constitution of Butyl Chloral. A. Lieben and S. Zeisel. (*Monatsh. Chem.*, iv. 531-539; *Journ. Chem. Soc.*, 1883, 963.) In a previous paper the authors have endeavoured to explain the manner in which condensation accompanied by elimination of water takes place between two molecules of the same or of different aldehydes; and in the present communication they examine the condensation of an aldehyde with a monohalogenated aldehyde, viz., that of acetaldehyde with its monochlorinated derivative, which may be expected to give rise to a monochlorocrotonaldehyde, represented by one of the following formulæ,—



Either of these compounds would be converted, by addition of chlorine, into a butyric chloral, $\text{C}_4 \text{H}_5 \text{Cl}_3 \text{O}$, isomeric or identical with that already known.

To obtain such a compound, monochloraldehyde, in the form of the crystallized hydrate, $\text{C}_2 \text{H}_3 \text{Cl O} \cdot \frac{1}{2} \text{H}_2 \text{O}$, was heated in a sealed tube with an equivalent quantity of aldehyde, a drop of strong hydrochloric acid being added as condensing agent, and the heating continued for several days. On distilling the contents with steam, there passed over, first an oil, then water, and lastly the hydrate of monochloraldehyde, whilst crotonaldehyde and higher boiling substances remained in solution. The residue consisted of a black unctuous substance, which hardened on cooling to a pitch-like mass, surmounted by a yellow, somewhat turbid liquid, exhibiting a strong green fluorescence. The oil obtained from the distillate, which was somewhat heavier than water, was dried over calcium chloride and distilled in a current of carbonic anhydride; it then passed over between 150° and 160° , but could not be obtained of constant boiling point. It is a colourless liquid, becoming thicker on keeping, and having an odour like that of crotonaldehyde, but more pungent. It gave by analysis 37.83 per cent. chlorine, whereas monochlorocrotonaldehyde requires 33.97 per cent. Nevertheless the body in question appears to consist mainly of chlorocrotonaldehyde, inasmuch as it is capable of uniting with chlorine, and forming a crystalline hydrate of trichlorobutyraldehyde or butyric chloral, $\text{C}_4 \text{H}_5 \text{Cl}_3 \text{O}$. The crystals of this hydrate are

orthorhombic, exhibiting the combination OP. P ∞ . P. Axes $a : b : c = 0.6486 : 1 : 1.1939$.

According to the formulæ above cited for monochlorocrotonaldehyde, butyric chloral must be represented by one of the two following, —

- (1) $\text{C H}_3 \cdot \text{C H Cl} \cdot \text{C Cl}_2 \cdot \text{C H O}$.
- (2) $\text{C H}_3 \text{ Cl} \cdot \text{C H Cl} \cdot \text{C H Cl} \cdot \text{C H O}$,

both of which differ from the formulæ hitherto assigned to it, viz., $\text{C Cl}_3 \cdot \text{C H}_2 \cdot \text{C H}_2 \cdot \text{C H O}$. To decide between the formulæ 1 and 2, it is necessary to ascertain whether butyric chloral contains an entire methyl-group, and with this view the authors prepared dichloropropylene, $\text{C}_3 \text{H}_4 \text{Cl}_2$ (b. p. 77°), by boiling the hydrate of butyric chloral with sodium carbonate, and heating it with chromic acid mixture in a sealed tube for forty-eight hours at 100° , and then for twenty-four hours at 130° . By this treatment the dichloropropylene was converted into acetic acid, showing that it contains an entire methyl-group, and must therefore be represented either by the formula $\text{C H}_3 \cdot \text{C H} : \text{C Cl}_2$, or by $\text{C H}_3 \cdot \text{C Cl} : \text{C H Cl}$. Hence also it follows that butyric chloral must be represented by $\text{C H}_3 \cdot \text{C H Cl} \cdot \text{C Cl}_2 \cdot \text{C H O}$, and this determines also the constitution of the numerous derivatives of butyric chloral, *e.g.*, trichlorobutyl alcohol, trichlorobutyric acid, trichlorangelactic acid, etc.

The formation of butyric chloral by the action of chlorine on aldehyde or paraldehyde may be explained in two ways: (1) The aldehyde is converted into crotonaldehyde, then into monochlorocrotonaldehyde, which, by the further action of the chlorine, is transformed into butyric chloral. (2) The aldehyde is first converted by the chlorine into monochloraldehyde, which, almost as soon as it is formed, condenses with the acetaldehyde, under the influence of the hydrochloric acid evolved at the same time, into monochlorocrotonaldehyde, and thereby gives rise to the production of butyric chloral in the manner above explained. The second view is supported by the consideration that crotonaldehyde has not yet been found amongst the products of the action of chlorine on acetaldehyde, and that in presence of water chloral is formed from aldehyde; a fact which points to the previous formation of monochloraldehyde.

The constitution of butyric chloral above established shows that the monochloraldehyde obtained by condensation must have the formula $\text{C H}_3 \cdot \text{C H} : \text{C Cl} \cdot \text{C H O}$, and that accordingly, in the process of condensation, the oxygen of the acetaldehyde must have

acted on the hydrogen atom of the monochloraldehyde nearest to the chlorine; and consequently that in this case, as in that of propaldehyde, the methylene-group is more readily attacked by the aldehydic oxygen than the methyl-group.

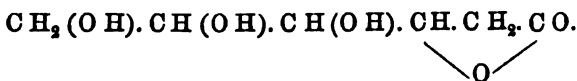
Formation of Methyl Iodide and Methylene Iodide from Iodoform. P. Cazeneuve. (*Comptes Rendus*, February 11, 1884.) The most favourable conditions for the production of these compounds are as follows:—500 grams of iron (reduced by hydrogen) are intimately mixed with an equal weight of finely powdered iodoform, and 200 grams of water are then added. A gentle heat is applied, and 120 grams are collected of a mixture comprising 40 grams methyl iodide and 80 grams methylene iodide, which are easily separated by heating in a vacuum.

Formation of Amyl Alcohol in Alcoholic Fermentation. J. A. Le Bel. (*Comptes Rendus*, xvi. 1368–1370.) The spirituous distillates from large quantities of wine, beer, and all other fermented saccharine liquids yield, upon careful fractional distillation, amyl alcohol, along with a small proportion of higher alcohols.

Oxidation of Menthol by means of Potassium Permanganate. G. Arth. (*Comptes Rendus*, March 3rd, 1884.) The author has obtained by this reaction two distinct acids. The second of these seems to be an intermediate product between the former, $C_{10}H_{18}O_3$, and the carbonic and oxalic acids.

Reduction of Saccharin. C. Liebermann and C. Scheibler. (*Ber. der deutsch. chem. Ges.*, xvi. 1821.) The authors confirm the accuracy of Kiliani's statement (*Annalen*, ccxviii. part 3), that the lactone obtained by the action of hydriodic acid on saccharin is α -methylvalerolactone. Methylpropylacetic acid (b. p. 190°) is also produced.

Saccharoné and Saccharin. H. Kiliani. (*Liebig's Annalen*, ccxviii. 361–374. From *Journ. Chem. Soc.*) Scheibler showed the formula of saccharin to be $C_6H_{10}O_6$, and suggested the constitution,—

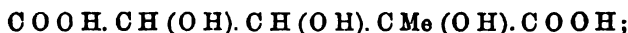


The author obtained acetic acid and glycollic acid by the oxidation of saccharin with silver oxide, and from this result he assumed it to contain the groups CH_3 and $\text{CH}_2.\text{OH}$. By the oxidation of saccharin with concentrated nitric acid, saccharoné, $C_6H_8O_6$, is produced, containing carboxyl, COOH , in the place

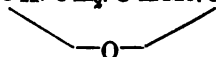
of $C_6H_2O_5H$; this compound is slightly laevorotatory, and forms large crystals of the formula $C_6H_8O_6, H_2O$; it yields two classes of salts e.g., *sodium saccharone*, $C_6H_7O_6Na$, and *sodium saccharonate*, $C_6H_8O_7Na_2$, the former of which is obtained by mixing saccharone solution with the calculated quantity of sodium carbonate, and evaporating, when rhombic crystals are obtained, sometimes anhydrous, and sometimes containing 1 mol. H_2O . Sodium saccharonate is obtained by boiling an aqueous solution of saccharone with the calculated quantity of sodium carbonate, and evaporating. *Ammonium saccharone*, $C_6H_7O_6.NH_4$, is obtained by neutralising a cold solution of saccharone with ammonia, and allowing it to evaporate spontaneously, whilst *ammonium saccharonate*, $C_6H_8O_7(NH_4)_2$, is prepared by boiling saccharone with an excess of ammonia. *Calcium saccharonate*, $C_6H_8O_7Ca$, and *silver saccharonate*, $C_6H_8O_7Ag_2$, have also been prepared, the former by boiling saccharone with lime-water, and the latter by precipitating an alkaline saccharonate with silver nitrate. Copper compounds are also obtained by boiling a solution of saccharone with copper carbonate. By the long-continued boiling (twenty-one hours) of a mixture of saccharone with hydriodic acid and amorphous phosphorus, an acid, $C_6H_{10}O_4$, is formed, which the author identifies as α -methylglutaric acid,



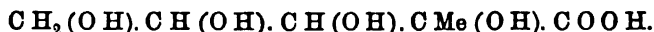
described by Wislicenus and Limpach (*Annalen*, cxcii. 134). If the heating is carried on for a much shorter period, an acid of the formula $C_6H_8O_4$ is produced. From the formation of α -methylglutaric acid, the author assigns to saccharonic acid the constitution



whilst for saccharone, which is the lactone obtained by the abstraction of 1 mol. water, two formulæ are evidently possible. In the same way hydriodic acid acts on saccharin, yielding α -methylvalerolactone, $CH_3.CH.CH_2.CHMe.CO$,



proving that saccharic acid has the constitution,



Maltose. A. Herzfeld. (*Liebigs Annalen*, ccxx. Parts 1 and 2.) The author examines the composition of the salts of maltose, and raises the questions: whether it is a simple anhydride of

glucose; whether, like saccharose and glucose, it is capable of forming double salts with certain haloid compounds; and whether maltose, when oxidized by means of bromine, and the product decomposed by treatment with silver oxide, forms dextronic or gluconic acids, or some other acid?

Relation between the Solubility and Rotation of Sugar of Milk. F. Urech. (*Ber. der deutsch. chem. Ges.*, xvi. 2270.) When finely divided milk-sugar is agitated with a quantity of water insufficient to dissolve it, a saturated solution is obtained, which exhibits bi-rotation; but the solution gradually takes up more milk-sugar as the transition from bi-rotation to normal rotation takes place, showing that the solubility is thereby increased. When two saturated solutions are prepared at temperatures differing by about 20°, and the warmer solution is allowed to cool down to the temperature of the other, it will still contain much more milk-sugar than the solution prepared at the lower temperature, the greater solubility at the higher temperature being due not only to the difference of temperature, but also to the more rapid conversion at a raised temperature of the bi-rotatory sugar into the much more readily soluble sugar of normal rotation. The transition from bi-rotation to normal rotation takes place slowly at atmospheric temperature, so that the rate of change can readily be measured by the polariscope, and formulated in the same way as the rate of inversion of saccharose.

Formation of Mannite from Dextrose and Levulose. F. W. Dafert. (*Ber. der deutsch. chem. Ges.*, xvii. 227.) C. Scheibler has recently concluded from various observations that the formation of mannite from dextrose and levulose, by the action of sodium amalgam, is due to a secondary process. The author has arrived at the same conclusion, at any rate as regards dextrose, from a study of the oxidation products of mannite. The products of oxidation of mannite vary according to the nature of the oxidizing agent, the time of action, and the temperature; they are carbon dioxide, water, formic acid, mannitic acid, saccharic acid, inactive tartaric acid, and probably glycollic acid. Besides these a product is formed, when the oxidation is carefully conducted, which is identical with the mixture of a fermentable sugar and a substance resembling mannitan, first observed by Gorup-Besanez (*Ann. Chem. Pharm.* cxviii. 257). Further investigation of these bodies has shown (1) that the so-called mannitose belongs to the group of glucoses, and (2) that the mannitose does not differ from grape sugar, as Gorup-Besanez states, only by its optical inactivity, but

also in its behaviour with hydrochloric acid, sulphuric acid, Fehling's and Knapp's solutions. The similarity in the behaviour of mannitose and levulose is very striking, and the author would pronounce them to be identical if the former could be obtained in a clearly optically active state. The properties of the second body are not characteristic; it has an insipid taste, does not reduce Fehling's solution, is not fermentable, and is probably optically inactive, and thus resembles the little-known compounds mannitin and dextran. The author has never observed the formation of dextrose. When the mixture is treated with sodium amalgam, mannite is re-formed; whence the author concludes that it cannot be in consequence of unsuitable conditions of oxidation that dextrose is not formed from the same mannite which is formed by the reduction of dextrose, when, under the same conditions, the easily decomposed mannitose is formed from mannite; or, in other words, that it is not from dextrose, but from a secondary product, possibly the second of the two substances mentioned above, to which Gorup-Besanez gives the formula $C_6H_{10}O_5$, or $C_6H_{13}O_5$, that the mannite is formed by reduction. By renewed oxidation of the two substances the capability of reduction is diminished; whence they cannot be regarded as intermediate products between mannite and dextrose. The author has only recently been able to separate the mannitose from the other substance, and he is therefore as yet unable to say whether it is physically isomeric or identical with levulose, or whether it is also a secondary product.

The Action of Dilute Acids on Starch. F. Salomon. (*Journ. pract. Chem.* [2], xxviii. 82.) The principal conclusions drawn by the author from this lengthy investigation are as follows: The transformation of starch by dilute sulphuric acid cannot be considered as a splitting up of the molecule into dextrin and dextrose, as assumed by Musculus. The products of the action of sulphuric acid on starch are soluble starch, dextrin, and dextrose; the course of the reaction being that the complex starch molecule is first converted into the more simple soluble starch, and next into the still more simple dextrin, the hydrolysis of the latter into dextrose commencing almost simultaneously. The rate of the conversion is proportional to the quantity of sulphuric acid present. The transformation of starch by organic acids (oxalic, tartaric, and citric acids) proceeds in the same manner as with inorganic acids, but the action is less vigorous.

Soluble starch, if pure, gives a deep blue coloration with iodine, but if it is contaminated with dextrin, a reddish violet coloration

is obtained; it does not reduce Fehling's solution, and has the specific rotatory power $[\alpha]_D = 211.5^\circ$. There is only evidence for the existence of a single dextrin; it gives a brownish red coloration with iodine, does not reduce Fehling's solution, and has the specific rotatory power $[\alpha]_D = 216.5^\circ$.

Contribution to the more Exact Knowledge of the Chemical Nature of Starch-Grains. B. Brukner. (*Monatsh. für Chem.*, iv. 889-912; *Journ. Chem. Soc.*, 1884, 575.) In 1856, Nägeli extracted a substance turned blue by iodine, and termed "granulose," from starch-grains, without, however, destroying their form. In 1859, Jessen found that on rubbing starch-grains with water, a portion of the soluble starch was dissolved. Nasse, in 1866, gave the name "amidulin" to a soluble body obtained from starch-paste. Nägeli, in 1874, extracted by dilute hydrochloric acid a body essentially different from starch, which he called "amylodextrin." The first object of the author is to determine the relation existing between these four bodies.

Amidulin.—Starch has generally been considered as insoluble in water. Jessen and Delff, by rubbing starch with water, extracted a portion; this might, however, have been due to the conversion into starch-paste by the heat evolved in the crushing of the granules. W. Nägeli imbedded starch-grains, and then cut sections; the portions of the granules were turned blue by iodine, as also was, to some extent, the small quantity of water employed, and hence a portion must have gone into solution. By rubbing dry starch granules, they may be broken, and if subsequently treated by water and filtered, they give a clear solution turned blue by iodine. But on allowing wheaten starch to digest with water for three weeks, filtering, evaporating, to one-fifth, and testing with iodine, no blue coloration was obtained; hence it is impossible to extract the inner and soluble starch with water until the outer membrane is either changed or broken; the character of the solution is that of a micellar solution; it is not capable of diffusion. The substance soluble in cold water and coloured blue by iodine, the amidulin of Nasse and the granulose of Nägeli, are identical.

Starch-paste.—Schimper and Nägeli are not agreed as to the distinction between swollen starch and starch-paste. Between these two states there is no sharp distinction; thus at 46° potato-starch swells distinctly; at 59° it begins to lose its form; and at 62.5° it is converted into a paste, and shows no trace of the original form. After discussing Nägeli's micellar theory, viz., that the smallest particles of starch and similar substances consist not o.

molecules, but of larger groups, *i.e.*, micellæ, which owing to their comparatively slow movements, due to their greater size and weight, easily unite into micellar clusters, the author concludes that swollen starch and starch-paste differ in nothing but the aggregate condition of their micellæ; they differ therefore physically but not chemically, and accordingly starch-paste, amidulin, and granulose are identical.

Erythrogranulose.—Erythrogranulose and erythrodextrin are the names given to two bodies coloured red by iodine (Brücke). By digesting starch solution with diastase, and testing portions from time to time with iodine and with tannin solution, it was shown that so long as iodine produced a blue coloration, tannin produced a precipitate, but with a red coloration no precipitate was formed, nor under these conditions was a precipitate produced by adding hydrochloric acid; hence the red coloration is due to the presence of dextrin. If very dilute iodine be added to starch-granules (or paste), a red colour is first produced; this is due to the presence of dextrin (erythrodextrin) and its greater solubility in water.

Amylodextrin.—W. Nägeli states that soluble starch is distinguished from amylodextrin by being precipitated from solution by tannin and by lead acetate, and further that freshly precipitated starch is insoluble in water, whilst freshly precipitated amylodextrin is soluble. None of these differences can be confirmed. Further, amylodextrin does not, like starch, swell up with an alkaline solution, but simply dissolves; this, however, is not a distinctive test, since precipitated starch behaves exactly like amylodextrin; amylodextrin is tinted by organic matter, just as starch is. It is also stated that Trommer's copper test is not reduced by amidulin, but is by amylodextrin; but it has been shown that the starch-grains themselves contain dextrin, and further, during the progress of the test, the starch becomes converted into dextrin and into sugars, and, still more important, dextrin is formed during the preparation of amylodextrin.

The author has been quite unable to confirm the statement as to the crystalline nature of amylodextrin. Amidulin and amylodextrin are identical. That amidulin—a body not capable of diffusion—can be extracted from starch-grains by dilute acid, is explained by the action of the acid on the micellar aggregates.

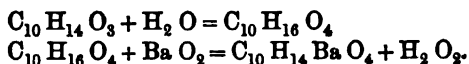
The Iodine Reaction.—The so-called iodide of starch is no chemical compound; it has been stated to be decomposed when heated. This depends on the affinity of warm water for iodine being greater

than that of cold water; and if this greater absorptive power be satisfied by addition of more iodine, then the blue colour is not destroyed even by boiling. The author considers the blue colour to be simply due to the solution of iodine in potato-starch, just as violet and brown colours are obtained on solution in chloroform and water respectively. Potato- and arum-starch yield blue colorations, wheat- and rice-starch yield violet; but after boiling they also are turned blue by iodine. Starch-grains have a greater attraction for iodine than unorganised starch; thus a cold, clear solution prepared from crushed starch-grains and coloured blue by iodine, is completely decolourized by adding whole starch-grains. Similarly, it is shown that starch-grains attract iodine more energetically than dextrin, the red solution being decolourized, and the starch-grains turning blue.

In conclusion, soluble starch, starch-paste, granulose, amidulin, and amylopectin are identical, i.e., give identical reactions; as also are erythrogranulose, erythropectin, and dextrin.

Camphoric Peroxide and Camphorate of Barium. C. T. Kingzett. (*Chemical News*, xlix. 44.) Brodie states (*Phil. Trans.*, 1863, 407) that when anhydrous camphoric acid is triturated with an equivalent quantity of hydrated barium peroxide in the presence of ice-cold water, and the mixture filtered, there is obtained a solution which is slightly alkaline, and which when rendered acid has the following properties: It bleaches indigo, oxidizes potassium ferrocyanide, decomposes hydriodic acid, and evolves oxygen when heated; but fails to give a blue coloration with chromic acid, and does not discolour potassium permanganate. Brodie concluded from his analyses, etc., that a new substance was formed, which was a barium salt of a camphoric peroxide, $C_{10}H_{14}BaO_5$, and not a camphorate of barium peroxide. The author believes that Brodie's experiments admit of another explanation, which is probably correct, viz., that when camphoric anhydride is triturated with water and barium peroxide, the anhydride is first resolved by the addition of a molecule of water into camphoric acid, which in its turn decomposes barium peroxide, forming camphorate of barium and peroxide of hydrogen. The author then gives a detailed account of his repetition, with some slight variations, of Brodie's experiments; he concludes that barium peroxide only acts upon camphoric anhydride in the presence of water, and that action is of a secondary character, the anhydride first becoming camphoric acid, which decomposes the peroxide of barium, and yields camphorate of barium. He also incidentally proves the existence of a

crystalline hydrate of camphorate of barium containing one molecule of water:—



Contribution to the Chemistry of Camphor. H. E. Armstrong and A. K. Miller. (*Ber. der deutsch. chem. Ges.*, xvi. 2255. From *Journ. Chem. Soc.*) By the action of zinc chloride on camphor, Fittig, Köbrich, and Jilke (*Annalen*, cxlv., 129) obtained a hydrocarbon, $\text{C}_{10} \text{H}_{14}$, which they regarded as most probably identical with ordinary cymene, together with much toluene, xylene, pseudocumene, and *laurena*; the last-mentioned being, according to their analysis, a hydrocarbon of the formula $\text{C}_{11} \text{H}_{16}$. By the same reaction, Montgolfier (*Ann. Chim. Phys.*, 1878 [5], xiv. 87) obtained what he thought to be cymene and an isomeric hydrocarbon boiling at about 195° , from which he prepared a dibromo-derivative melting at 199° ; this isomeric hydrocarbon he assumed to be Januassch's tetramethylbenzene (1:2:3:5), and regarded it as identical with Fittig's *laurene*. From the fraction boiling at 173 – 176° , supposed to be cymene, Fittig, Köbrich, and Jilke prepared a sulphonic acid, the barium salt of which contained 10.13 per cent. water; whereas ordinary barium cymene sulphonate contains 8.75 per cent. It would seem that Montgolfier prepared the same salt (with 10.74 per cent. water) from the crude distillate boiling at about 195° . Fittig's fraction boiling at 188° ($\text{C}_{11} \text{H}_{16}$), was assumed to be a dimethylpropylbenzene, as it yielded a dibromo-derivative melting at 125° , and on oxidation gave monobasic lauroxylic acid, $\text{C}_9 \text{H}_{10} \text{O}_2$, melting at 155° .

The authors heat camphor with twice its weight of zinc chloride at a moderate temperature, until a homogeneous mixture is obtained, and then distil at as low a temperature as possible. The crude distillate is extracted with sodium hydrate solution, then steam-distilled, and the distillate is agitated with dilute sulphuric acid (4 vols. acid to 1 vol. water), to remove the unattacked camphor, and again steam-distilled. On passing steam into the retort, a second distillate is obtained, consisting of camphorone, $\text{C}_9 \text{H}_{14} \text{O}$, and camphor mixed with some hydrocarbon, which can be separated by means of sulphuric acid of the above strength, in which the camphorone is soluble; a residue of zinc chloride mixed with a black carbonaceous mass remains in the retort. The above-mentioned alkaline extract yields pure carvacrol on addition of an acid.

When the mixture of hydrocarbons remaining after treatment of

the crude distillate with dilute sulphuric acid is heated with sulphuric acid, a considerable amount of a saturated hydrocarbon, $C_{10}H_{20}$, remains undissolved; whilst the sulphuric acid solution contains principally benzene hydrocarbons of the formula $C_{10}H_{14}$, only a very small amount of lower and higher homologues being formed, together with a hydrocarbon which has not yet been isolated, and which is carbonised by the action of heat on the dilute acid solution. The chief constituents of the hydrocarbon mixture are a *methylpropylbenzene*, a *dimethylethylbenzene*, and a *tetramethylbenzene*; ordinary cymene was found to be absent. The sulphonic acid of the first-mentioned hydrocarbon yields a very sparingly soluble anhydrous barium salt, a sodium salt containing 1 mol. of H_2O , and an anhydrous potassium salt, the last two crystallizing in large lustrous plates. The hydrocarbon boils at 176° , is oxidized by dilute nitric acid to metatoluic acid, and is identical with the metaisopropylmethylbenzene discovered by Kolbe in rosin spirit. The dimethylbenzene (b. p. 189°) is probably identical with Fittig's laurene; it yields paraxylic acid on oxidation, and must therefore have the constitution $[Me : Me : Et = 1 : 2 : 4]$. It yields two isomeric sulphonic acids. From the chief product there may be obtained a barium salt crystallizing with $4H_2O$, and a magnesium salt containing about 25 per cent. water, magnesium cymenesulphonate containing 16.6 per cent. The tetramethylbenzene is identical with Jaunisch's isodurene, and yields a dibromo-derivative melting at 209° , as stated by Jacobsen.

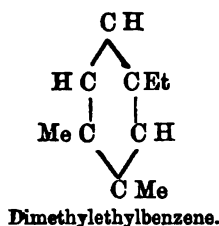
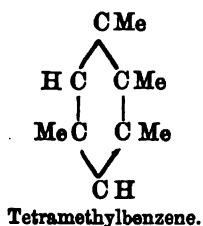
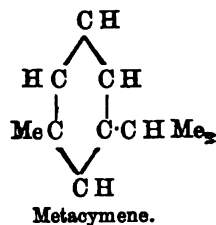
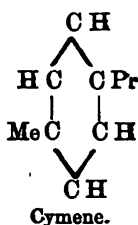
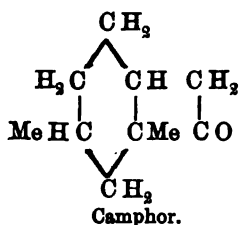
The chief products of the action of iodine on camphor are carvacrol, and the saturated hydrocarbon, $C_{10}H_{20}$. Dimethylethylbenzene and tetramethylbenzene are also formed, but no cymene or meta-cymene.

Ordinary cymene appears to be the only benzene hydrocarbon which is formed by the action of phosphoric anhydride on camphor, and is also the chief product of the action of phosphorus pentasulphide; but in the latter case a considerable amount of metaisopropylmethylbenzene, and a small quantity of tetramethylbenzene are also obtained, together with traces of higher and lower homologues, and a small percentage of the hydrocarbon $C_{10}H_{20}$. The hydrocarbon which carbonises when its sulphuric acid solution is heated (see above), is also formed by the action of phosphorus compounds and of iodine on camphor.

The formation of these different hydrocarbons from camphor cannot well be represented by Kekulé's formula, but can be to some extent accounted for by the assumption of the following formula,

I

which is a slight modification of that previously suggested by Armstrong (*Ber.*, xi. 1698; xii. 1756):



Borneol from Camphor. J. Kachler and F. V. Spitzer. (*Monatsh. für Chem.*, v. 50.) Jackson and Menke (*Amer. Chem. Journ.*, 1888, 270) state that if camphor (10 grams) be dissolved in ten times its weight of alcohol, and one-third more (4 grams) than the theoretical quantity of sodium be gradually added, the camphor is converted into borneol, 9.4 grams of the latter, or 94 per cent., being obtained. The authors have repeated these experiments, but can not confirm the results. Mixtures of camphor and borneol were obtained, the unchanged camphor always largely predominating.

As the separation of borneol from camphor is impracticable, this reaction does not form a means of preparing borneol. The product, analysed by treatment with phosphoric chloride (when borneol yields $\text{C}_{10}\text{H}_{17}\text{Cl}$, and camphor $\text{C}_{10}\text{H}_{16}\text{Cl}_2$), was proved to contain 22.8 per cent. borneol, and 77.2 per cent. camphor.

Carvol. A. Beyer. (*Archiv der Pharm.* [3], xxi. 283-288; *Journ. Chem. Soc.*, 1884, 331.) Gladstone has shown that the carvol obtained from dill oil agrees in its principal physical properties with the carvol from caraway oil. Flückiger found that the carvol obtained from German mint oil, *Mentha crispa*, differed from the carvol from the other two sources in being strongly laevorotatory. The author has re-examined the carvol obtained from these three oils. To obtain it the crude oils were distilled, the portion of the caraway oil distilling at 223° , those of the German mint oil at

215–230°, and 200–215° being employed. The crude dill oil was used without distillation. The sulphuretted hydrogen compounds, $(C_{16}H_{14}O)_2$, H_2S , were first obtained in the crystalline state, and recrystallized from a mixture of three parts of chloroform and one of alcohol. The yield from caraway oil was 8 per cent., that from dill oil 40 per cent., whilst the first fraction of the mint oil yielded 50 per cent., the second fraction 30 per cent. All the sulphuretted hydrogen compounds melted at 187°. The specific rotatory power, $[\alpha]_D$ at 20°, of the compound from caraway oil was +5.53, from dill oil +5.44, from mint oil –5.55. No crystallographic difference in the compounds could be detected. By the action of sulphuretted hydrogen on an alcoholic solution, all the three compounds were converted into the amorphous thiocarvol, $(C_{10}H_{14}S)_2$, H_2S . The carvol obtained from all the sulphuretted hydrogen compounds agreed in boiling point and density; and the specific rotatory power of carvol from caraway oil and dill oil was nearly the same, being dextrorotatory; the carvol from mint oil, however, was lævorotatory ($[\alpha]_D = -62.46$ at 2°).

The carvol from mint oil was distilled from metaphosphoric acid, the resulting *carvacrol* dissolved in potash solution, filtered, decomposed with sulphuric acid, and the *carvacrol*, $C_{10}H_{14}O$, was dried over calcium chloride. It solidified at –20° to a crystalline mass. The boiling point was 230–231°; sp. gr. at 4° 0.975, specific rotatory power 0. The crystalline barium salt of *carvacrolsulphonic acid* was also prepared. It was thus shown that the *carvacrol* from lævorotatory carvol is identical with the *carvacrol* from dextrorotatory carvol. A small quantity of a hydrocarbon boiling at 168–171° was obtained from the mint oil. It was lævorotatory, and appeared to be a terpene.

Thiophene, a Substance contained in Coal-Tar Benzene. V. Meyer. (*Ber. der deutsch. chem. Ges.*, xvi. 1465–1478; *Journ. Chem. Soc.*, 1883, 1091.) The fact that benzene from coal-tar has the power of yielding a deep blue coloration, due to the formation of indophenine, when shaken with isatin and strong sulphuric acid, is owing to the presence of about 0.5 per cent. of a sulphur compound, C_8H_4S , to which the author has given the name *thiophene*. Benzene from benzoic acid does not contain this impurity, and consequently does not yield the indophenine reactions with sulphuric acid and isatin.

In order to obtain thiophene in sufficient quantity for investigation, 250 litres of the purest commercial benzene were shaken with 25 litres of strong sulphuric acid for four hours. The layer of acid

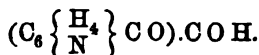
was separated from the benzene, diluted with water, and a lead salt of thiophenesulphonic acid precipitated. The oily liquid obtained by distilling the lead salt with ammonium chloride is washed with water and with potash, to remove mercaptan. It is then dried over calcium chloride and distilled. The distillate (b.p. 84°) consists of a mixture of thiophene (70 per cent.), and benzene (30 per cent.). It does not solidify when surrounded by a freezing mixture of ice and salt. It dissolves in concentrated sulphuric acid at the ordinary temperature, but the solution soon decomposes, evolving sulphuretted hydrogen and sulphurous anhydride. Decomposition does not, however, ensue if the liquid is diluted with 100 times its volume of light petroleum. Pure thiophene is obtained by converting this sulphuric acid solution into lead thiophenesulphonate, and distilling the lead salt with ammonium chloride. Thiophene is a colourless mobile oil boiling at 84° , immiscible with water. Its sp. gr. at 23° is 1.062 compared with water at the same temperature. Thiophene is not attacked by sodium, but is readily oxidized by nitric acid, and yields two substitution-products when acted on by bromine. *Monobromothiophene* (b.p. 150°) is produced in small quantities in the preparation of the dibromo-compound. It bears a close resemblance to monobromobenzene. The sp. gr. of the compound is 1.652 at 23° . *Dibromothiophene* (b.p. 211°) closely resembles dibromobenzene in its chemical and physical properties. Like this substance, it does not readily wet glass. The sp. gr. of dibromothiophene is 2.147 at 23° .

In consequence of the author's discovery that the formation of indophenine is entirely due to the presence of thiophene in the benzene used, Baeyer has examined his specimen of indophenine, and found that it contains sulphur.

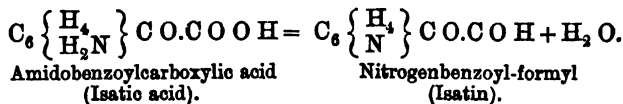
Action of Bromine on Aromatic Hydrocarbons. J. Schramm. (*Liebig's Annalen*, ccxviii. 383-396. From *Journ. Chem. Soc.*) It has been shown by Radziszewski that bromethylbenzene is decomposed by distillation into styrene and hydrobromic acid (*Ber.*, vi. 493), and that bromopropylbenzene and bromobutylbenzene also suffer analogous decomposition. The author has experimented with other aromatic hydrocarbons with the view of ascertaining if the above reaction is a general one, and has adopted this method for the preparation of unsaturated hydrocarbons. *Pentylbenzene*, $C_6H_5.C_5H_{11}$, obtained by the action of sodium on benzyl bromide and pentyl bromide, is a colourless liquid of agreeable odour, boiling at $200.5-201.5^{\circ}$ under a pressure of 743 mm. Its sp. gr. is 0.8602 at 22° . The preparation of *isopentylbenzene* (b. p. 193°) has been de-

scribed by Fittig and Tollens (*Annalen*, cxxix. 369, and cxxxi. 313). *Hexylbenzene*, $C_6H_5 \cdot (CH_2)_3 \cdot CHMe_2$, is formed by the action of sodium on a mixture of benzyl bromide and isopentyl bromide; it boils at $212-213^\circ$, and has a sp. gr. of 0.8568 at 16° . When bromine-vapour is brought into contact with pentylbenzene heated in an oil-bath at $150-155^\circ$ it is readily absorbed, with evolution of hydrobromic acid; and on distilling the monobromo-derivative thus formed, phenylpentylene is obtained, boiling at $210-215^\circ$. It combines with bromine to form a dibromide melting at $53-54^\circ$, crystallizing in needles or scales readily soluble in ether and alcohol. In the same way *phenylisopentylene*, $C_{11}H_{14}$, can be obtained; it is a colourless liquid, of sp. gr. 0.878 at 16° , boiling at $200.5-201.5^\circ$. The dibromide, $C_{11}H_{14}Br_2$, crystallizes from alcohol in white silky needles, readily soluble in ether, benzene, and toluene, and melting at $128-129^\circ$. Hexylbenzene behaves exactly in the same way as the above hydrocarbons, yielding *phenylhexylene* and the dibromide $C_{13}H_{16}Br_2$, the latter forming star-like groups of needles or scales melting at $79-80^\circ$.

Isatin. H. Kolbe. (*Journ. für pract. Chem.* [2], xxvii., 490-497. From *Journ. Chem. Soc.*) The author considers isatin to be a compound of formyl with benzoyl, the latter having one of its hydrogen-atoms replaced by an atom of monovalent nitrogen. It is therefore nitrogenbenzoyl-formyl.



He considers that when isatic acid loses water and forms isatin, the two hydrogen-atoms of the amido-group^a combine with the oxygen-atom of the hydroxyl-group, and that the carboxyl is converted into formyl according to the equation:—



When isatin is treated with phosphorus pentachloride, he considers that the trivalent-group CCl is formed, the formula of the chloride being $(C_6 \left\{ \begin{smallmatrix} H_4 \\ N \end{smallmatrix} \right\} CO \cdot CCl) \cdot (C_6 \left\{ \begin{smallmatrix} N \\ H_4 \end{smallmatrix} \right\} CO \cdot CCl)$. On replacing the chlorine with hydrogen, the compound nitrogen-benzoyl-methine or indigo-blue is formed.

The author considers isatin, dioxindole, and indole to be analogously constituted formyl compounds, and represents their compo-

sition by corresponding formulæ. He considers indole to be a compound of nitrogen-benzoyl with the univalent radical $(\text{CH})'$, its formula being $(\text{C}_6 \left\{ \begin{smallmatrix} \text{H}_4 \\ \text{N} \end{smallmatrix} \right\} \text{C H}_2)' . (\text{CH})'$.

Tobacco Fat. R. Kissling. (*Ber. der deutsch. chem. Ges.*, xvi. 2432.) In order to obtain in a pure state the vegetable wax occurring in tobacco, the latter is extracted with ether, the extract, after the removal of the greater part of the ether, mixed with alcohol, and the precipitated wax purified by repeated crystallization from hot alcohol. The wax then forms a snow-white mass of satiny lustre, melts at 63° , and on analysis gave numbers agreeing with the formula, $\text{C}_{70} \text{H}_{140} \text{O}_2$; but after removal of a small quantity of a substance insoluble in cold ether, the results agreed better with $\text{C}_{60} \text{H}_{120} \text{O}_2$ (mellissyl-mellisate).

The Colouring Matter of Cochineal. H. Fürth. (*Ber. der deutsch. chem. Ges.*, xvi. 2169; *Journ. Soc. Chem. Ind.*, 1884, 27.) Liebermann and Van Dorp (*Liebig's Annalen*, clxiii. 97) obtained ruficoccin ($\text{C}_{16} \text{H}_{10} \text{O}_6$) by the action of $\text{H}_2 \text{SO}_4$ on carmine, and by distilling ruficoccin with zinc powder they obtained a minute quantity of a hydrocarbon ($\text{C}_{16} \text{H}_{12}$). The author obtained this same body by reducing in a similar way either coccinin (*Liebig's Annalen*, cxli. 329) or carmine itself, but in both cases the amount obtained was very small. When coccinin, mixed with many times its bulk of zinc powder, is heated in a tube, white vapours are first given off, which partly condense in the form of greenish coloured leaflets; these were mixed with the yellow distillation product, also obtained in the condenser, and purified by repeated crystallizing from ether, alcohol, and benzene, and finally by sublimation. The product (m. p. $186-187^\circ$) is identical with that obtained from ruficoccin. If coccinin is heated with acetyl chloride to 100°C . in a sealed tube, an acetyl compound of coccinin is produced, which separates from a hot alcoholic solution on cooling in the form of yellow crystals. It is insoluble in water, but readily soluble in alcohol and in glacial acetic acid. If the formula of the above-mentioned hydrocarbon is accepted as $\text{C}_{16} \text{H}_{12}$, the formula of coccinin is found to be $\text{C}_{16} \text{H}_{14} \text{O}_6$, and that of its acetyl derivative, $\text{C}_{16} \text{H}_{10} \text{O}_2 (\text{C}_2 \text{H}_3 \text{O}_2)_4$. Coccinin would therefore appear to be the hydrate of a quinone of the hydrocarbon in question, and containing four hydroxyl groups. The hydrocarbon is also obtained from carmine by simply heating the latter in a tube with zinc powder. The distillation product is dissolved in ether, the solution is shaken with KHO , then with HCl , and thus purified is allowed to crystallize. Its melting point is

186°. It is identical with that obtained from ruficoccin by Liebermann and Van Dorp, and with that obtained from coccin.

Santalin. (*American Drugg.*, 1884, 93, from *Zeitschr. für Analyt. Chem.*) The method here recommended for the extraction of santalin from sandal-wood consists in boiling the crushed wood with water to eliminate its tannin, heating the residue with a solution of borax, and saturating it with lime until the colouring matter is entirely removed. The filtered liquid is then treated with sulphuric or hydrochloric acid until no further precipitate is obtained. This red, bulky precipitate is filtered out and dissolved in boiling alcohol, and on cooling the santalin separates in the form of a red crystalline powder.

Gelatin. H. Weiske. (*Bied. Centr.*, 1883, 673.) The author has prepared gelatin in various ways, and has found that the products differ in properties. Pieces of bone were treated repeatedly and for a long time with dilute hydrochloric acid, to remove the inorganic matter as completely as possible; they were then washed. Gelatin made from this is not precipitated from its solutions by tannic acid unless a few drops of a solution of a salt (sodium chloride, etc.) are added simultaneously; in other respects it does not differ from ordinary gelatin. By boiling bones free from mineral matter with repeated quantities of water, and then dissolving the residue by heating with water under pressure, two solutions are obtained, which when evaporated to dryness at 100° yield two kinds of gelatin, differing from one another, and also from the above variety, in various properties.

New Volumetric Method for the Estimation of Arsenic. L. W. McCay. (*Chemical News*, xlviii. 7-9.) The finely powdered substance is mixed with four or five times its weight of a mixture of equal parts of sodium carbonate and potassium nitrate, and thoroughly fused in a porcelain crucible. After half an hour the crucible and contents are allowed to cool, and then extracted with hot water; the solution is filtered, the filtrate acidulated with nitric acid, the carbonic anhydride boiled off, and the solution evaporated to dryness and heated until no more acid fumes are evolved. The residue is taken up with water, filtered, made up to a definite volume, and the arsenic determined in the following manner:—

The solution of arsenic acid or arsenate is heated to boiling, and excess of standard silver nitrate solution added; the liquid is then stirred briskly until the precipitate begins to settle and the liquid becomes clear, when the beaker is to be removed from the flame and left to cool to about 37°. Dilute ammonia is now carefully

added until a cloudiness ceases to form. The solution should be well stirred before each successive addition, so as to obtain a clear liquid in order to observe the cloud formation more distinctly. The silver arsenate is finally filtered off and well washed; the filtrate is acidulated with nitric acid; ferric sulphate (a few drops, 5 c.c. or so) added; and the silver titrated with ammonium thiocyanate according to Volhard's method. The amount of silver thus found deducted from the quantity taken gives the amount combined with the arsenic; and from this the quantity of arsenic present is calculated.

The following solutions have been employed by the author:

1. Ammonia, containing 100 c.c. $\text{NH}_4 \text{HO}$ to 1000 c.c. of water.
2. Argentic nitrate, with 39.352 grams $\text{AgNO}_3 = 25$ grams Ag to 1000 c.c. water.
3. Ammonium thiocyanate, 7.05 grams to 1000 c.c. water; 1 c.c. = 0.00774 Ag .
4. Ammonium ferric sulphate, a cold saturated solution.
5. Nitric acid free from lower oxides.

The author has examined by this method arsenic acid, ammonium arsenate, a nickel matte, and a sample of "speiss-cobalt," in many cases checking the results by the ammonium magnesium arsenate method, and has obtained excellent results.

Volumetric Determination of Mercury. A. Haswell. (*Zeitschr. für Analyt. Chem.*, 1883, Part 3.) The solutions required are:—Permanganate of known strength; ferrous sulphate acidified with sulphuric acid and standardised against the permanganate employed; and a moderately concentrated solution of stannic chloride, containing neither free chlorine nor stannous chloride. It is prepared by dissolving pure tin in hydrochloric acid with the addition of potassium chlorate, boiling the solution until all chlorine has evaporated, and precipitating with sodium carbonate. The filtered precipitate dissolved in hydrochloric acid should be reddened for at least three hours by a single drop of permanganate. In the execution of the process the solution of mercuric chloride, measured off with the pipette, is mixed with a known excess of the ferrous sulphate, and supersaturated with pure potash. The blackish brown precipitate thus formed is digested for a few seconds, shaking the glass, acidified then with sulphuric acid of a moderate strength, and agitated till the permanent precipitate of mercurous chloride appears perfectly white. The excess of ferrous oxide is then at once oxidized with permanganate without filtration. This process may

be regarded as complete when the milk-white liquid takes a peach-blossom colour. For the titration of the mercury a few drops of the stannic chloride are added, and permanganate is run in till the liquid is coloured a permanent red. The liquid becomes gradually clearer during the addition of the permanganate, but does not always become quite limpid.

Volumetric Determination of Mercury. G. Kroupa. (*Chemiker Zeitung*. From *Chemical News*, xlix. 14.) If recently precipitated mercurous chloride is covered with sulphuretted hydrogen water, the mercurous chloride is at once transformed into sulphide and hydrochloric acid. If the excess of hydrogen sulphide is removed in a suitable manner, and the quantity of chlorine in the solution determined, the proportion of mercury may be readily calculated. The author proceeds in the analysis as follows: If the mercury is present in the mercurous state, it is precipitated at once with sodium chloride. If it exists in the mercuric state and no hydrochloric acid is present, a sufficiency of sodium chloride is added, and then a solution of ferrous sulphate and an excess of potash. The mixture is allowed to stand for a few minutes in the cold, and is diligently stirred with a glass rod. The precipitate of mercurous oxide and ferroso-ferric oxide is strongly acidified with dilute sulphuric acid, and stirred till the black precipitate has become a pure white, the formation of mercurous chloride being complete. This is filtered off, washed well, placed along with the filter in a beaker, covered with sulphuretted hydrogen water, and allowed to stand for a few minutes. The hydrochloric acid formed is neutralised by the addition of an excess of elutriated barium carbonate, whilst the excess of sulphuretted hydrogen is removed by a solution of zinc acetate, which towards the end is added in drops until no more odour of sulphuretted hydrogen is perceptible. The precipitate is mixed with an excess of potassium chromate and titrated with silver solution in such a manner that at first a small excess of silver is added, which is then removed by means of a measured quantity of an equivalent solution of sodium chloride, and the operation finally completed with a centinormal silver solution.

A New Test for Tin. C. R. Dryer. (*Chemical News*, xlviii. 257.) The test described by the author consists in a reverse application of the well-known delicate reaction between stannous chloride and a nitric acid solution of brucine. The reagent is prepared as follows:—To 1 decigram of crystallized brucine add 1 c.c. of pure nitric acid; when solution is complete, add 50 c.c. of water, heat to boiling, and cool. The heating is not necessary, but renders the

reagent somewhat more sensitive. It is of a permanent orange-amber colour.

In the ordinary course of analysis the sulphides of arsenic, antimony, and tin are obtained upon a filter, and are digested with ammonium carbonate for the removal of arsenic. The residue is dissolved in strong hydrochloric acid, the solution evaporated, diluted with water, and a strip of platinum and one of zinc placed in it in contact for several hours. Nascent hydrogen reduces antimony chloride to metal, which is deposited upon the platinum, and stannic chloride to stannous chloride, which remains in solution. Now, if to a few drops of the brucine reagent in a white dish a drop of the solution containing stannous chloride be added, a distinct purple colour is produced.

Neither zinc chloride nor nascent hydrogen produces any effect upon the reagent. Organic matter does not interfere. Ammonium sulphide and sodium hyposulphite act like stannous chloride.

By using a solution of stannous chloride repeatedly diluted, it was found that a drop containing only 0.0000025 gram gave a distinct colour after about one minute. A drop containing 0.00002 gram gave a barely perceptible cloudiness with mercuric chloride.

If the reagent be too dilute, the colour is pale and the reaction indistinct. If excess of brucine be used, no purple colour is produced, but a dirty green or a decolorization resembling the morphia reaction.

The Behaviour of Silver Chloride, Bromide, and Iodide towards Bromine and Iodine. P. Julius. (*Chemical News*, xlviii. 284.) Bromine vapour was passed over silver iodide and over a mixture of iodide and bromide, the substances being kept for ten minutes in a state of fusion.

Through a tube, bent at right angles, a current of air was passed, previously dried, by means of sulphuric acid and calcium chloride, into bromine contained in a small Hofmann's flask.

The air, saturated with bromine vapours, passes thence into a horizontal tube of very infusible glass, containing the substance to be acted upon. At its opposite end this tube is bent down at right angles and somewhat contracted, and passes into a beaker containing potash or soda. The part of the tube containing the substance is strongly heated by means of a compound Bunsen burner of four jets. In this manner bromine can be accurately determined in presence of iodine, as the conversion of silver iodide into bromide is easy and complete.

Silver chloride, previously dried in the air-bath at 120°, was

treated in the same manner with vapours of bromine. After the action had been continued for one to two hours, it was found that all the silver chloride had been converted into bromide.

By further experiments it was proved that chlorine and bromine can be expelled from their silver-compounds by the vapour of iodine, though in case of the chloride this substitution requires from six to ten hours. Hence, any halogen, if applied in excess, is capable of expelling any other halogen from its combination with silver.

Separation of Cobalt and Nickel. J. Clark. (*Chemical News*, xlviii. 262.) The solution containing the two metals in the form of chlorides, nitrates, or sulphates, is mixed with a moderate excess of phosphate of ammonia (about five times the weight of the combined cobalt and nickel is sufficient), and for every part of phosphate of ammonia about 5 parts of ordinary hydrochloric acid are added, and the mixture is boiled for several minutes to make sure that all the phosphoric acid is in the state of ortho-phosphoric acid; the beaker or other vessel is then removed from the flame, and while still nearly boiling ammonia is added cautiously, in small quantities at a time, till the precipitate, which is at first produced, re-dissolves. The solution is then stirred vigorously for about a minute, when the cobalt will separate out as a fine purple crystalline powder, consisting of ammonio-phosphate of cobalt. About 10 drops of ammonia are then added, and the beaker placed for a few minutes on the top of a water-bath. When the precipitate has settled it is thrown upon a filter, washed with cold water, dried, ignited, and weighed as pyrophosphate of cobalt, $\text{Co}_2\text{P}_2\text{O}_7$, containing 40.4 per cent. of cobalt. The filtrate from the cobalt will be more or less of a clear blue colour, the intensity depending on the quantity of nickel present. As the filtrate usually contains a small quantity of cobalt, it is advisable to heat it at 100 C. till a small quantity of the nickel begins to come down. If the whole of the cobalt has been thrown down, this precipitate will be green in colour, but if there was any cobalt in the solution it will be more or less red. In any case, it is filtered off, dissolved in hydrochloric acid, and any cobalt which it may contain is estimated as before, and the filtrate, which contains nickel, is added to the other nickel filtrate. The nickel may then be precipitated by saturating the ammoniacal solution with H_2S , filtering off the sulphide of nickel, igniting, then dissolving in nitro-hydrochloric acid, precipitating with caustic potash, and weighing as oxide.

In estimating cobalt and nickel in ores, the author prefers to precipitate these metals as sulphides in an acetic acid solution.

Great care requires to be taken to eliminate manganese, as that metal interferes with the correct estimation of the cobalt. The mixed sulphides, after ignition, are weighed, for the purpose of ascertaining approximately the quantity of cobalt and nickel. They are then dissolved in nitro-hydrochloric acid, and the cobalt estimated in the manner already described.

The Qualitative and Quantitative Separation of Bismuth and Copper. J. Loewe. (From *Zeitschr. für Analyt. Chem. Chemical News*, xlviii. 296.) Some time ago the author published the observation that the oxides of bismuth and copper in solution are precipitated by soda or potash in presence of glycerin, but are completely re-dissolved by an excess of the precipitant. In this alkaline solution both show a similar behaviour with a solution of glucose at a boiling heat, being both reduced: the copper to red cuprous oxide, and the bismuth to grey, finely-divided metal. They differ, however, in their behaviour with glucose, in the cold or at a gentle heat: copper in the course of several hours being completely deposited in the form of red cuprous oxide, whilst the alkaline solution of bismuth undergoes no change. Not until after the solution has stood for some days are small quantities of the bismuth deposited in the metallic state. This reaction may be very conveniently used for separating copper and bismuth, as well quantitatively as qualitatively, from a mixed solution in nitric acid, in all cases when the bismuth predominates.

For this purpose the nitric acid solution, not too acid and not too concentrated, is placed in a beaker and mixed with a measured volume of soda-lye until the oxides are precipitated and the supernatant liquid shows an alkaline reaction. During this process the temperature must not be allowed to rise. Then double the volume of the lye consumed is added, and pure, syrupy glycerin is then stirred in until the oxides are completely re-dissolved and the liquid becomes clear. This deep blue solution is mixed with a solution of pure glucose (1 part in 6 to 8 parts of water) in such a proportion that the sugar may amount to three or four times the joint weight of the metals. The beaker is then covered with a well-fitting glass plate, and the liquid is allowed to stand eight to ten hours in a cool, dark place. The blue colour is then found to have given place to a deep yellow, whilst the copper is deposited at the bottom of the beaker as a bright red oxide, mostly not adhering to the glass. The yellow liquid is poured off, without stirring, upon a filter which has been dried at 100°, and weighed. The cuprous oxide is washed by decantation, first with water containing a little glycerin, and

soda-lye, collected upon the filter, and then well washed with distilled water. After the last portions of washing-water, which should be free from alkaline reaction, are run off, the filter is cautiously lifted out of the funnel, laid upon good absorbent paper, and then dried at 100° in the air-bath. The increase of weight of the filter gives the quantity of red oxide, 100 parts of which represent 88.8 parts of metallic copper.

Where greater accuracy is required, the red oxide obtained after weighing is converted into oxide in the ordinary manner after incineration of the filter, etc., and the copper is determined in its solution by any ordinary method.

The alkaline filtrate, containing all the bismuth, is placed in a sound, well-glazed porcelain capsule, heated to a boil over a free flame, stirring gently, kept at this temperature for a short time, removed from the source of heat, and the brownish liquid is allowed to cool and settle. It is then filtered through a filter which has been dried at 100° and weighed. The metallic bismuth is first washed by decantation with water containing soda, collected on the filter, and further washed, first with cold and then with hot water. The drying is effected as in the case of the cuprous oxide, and the increase of weight of the filter gives the quantity of the bismuth.

The glaze of the porcelain capsule must be of the best quality, lest any particles of metal may be deposited upon it and prove hard to remove. The metal is also reduced in the water-bath, but less rapidly than over the naked flame.

The finely divided metallic bismuth must be washed and dried as rapidly as possible, so as not to remain too long in contact. The filter must be of the best paper, as the fine metallic particles may otherwise easily pass through.

If the weight of the bismuth is decidedly greater than that of the copper, this process yields very satisfactory results. The author purposes to make further investigations on the converse case.

Tests for the Purity of Bismuth Subnitrate. H. Hager. (*Drug. Circular and Chem. Gazette.*) The author publishes the following directions in the *Pharmaceutische Centralhalle* :—

The preparation should dissolve completely to a clear solution in nitric acid of 1.185 sp. gr. The subarsenate of bismuth also forms a clear solution with pure nitric acid of this strength, but not when the acid is saturated with subnitrate of bismuth. It requires eight parts of this acid to form a clear solution of one part of subnitrate of bismuth in fifteen minutes. If 0.5 gram of the subnitrate is treated with 4 grams of nitric acid, and does not dissolve in half an

hour with occasional shaking, but is either turbid or exhibits a slight opalescence when viewed from above, it contains arsenic; a considerable quantity in the former case, in the latter case but little. All commercial samples tested were contaminated with arsenic.

The optical test for arsenic acid is easy, and can be made even by those who are not chemists. It depends on the fact that arseniate of ammonia is not decomposed by heat into its two components, but rather undergoes an elementary decomposition, turning brown. The test is made as follows, and at the same time it may be tested for alkalis. About three or four grams of caustic ammonia are poured upon a gram of subnitrate of bismuth, and warmed to 30–40° C. (86–104° F.), and shaken, then filtered while warm. Arseniate of ammonia dissolves with difficulty in cold ammonia, but easily in warm. One or two drops of the filtrate are placed on a thin watch glass, and heated by moving it to and fro over the chimney of a kerosene lamp, as long as vapours are noticed, that is, until all the nitrate of ammonia has been driven off, and a few minutes longer. On examining the residue with transmitted light, if arseniate is present a brownish colour will be observed, which becomes dark brown on the edges of the spot. Under the microscope dark grey or brown masses may or may not be seen here and there. If not, it must be heated still more. The colour of the spot as seen with the naked eye is sufficient. If potash or soda were present, the spot will not disappear on heating strongly. This experiment is entertaining and instructive, for remote traces of arseniate can be easily recognised in this way.

The test for alumina and other earths can be made in a similar manner by pouring $1\frac{1}{2}$ gram of dilute acetic acid upon a gram of the bismuth preparation, warming, and when cold adding 5 c.c. of caustic ammonia with 2 c.c. of water, shaking for three minutes, filtering, evaporating the filtrate, and neutralising with carbonate of soda. If it remains turbid, earthy salts were present.

A New Test for Lead. A. W. Blyth. (*Analyst*, 1884, 41.) A solution of cochineal is prepared by boiling the ordinary commercial cochineal in water, filtering, and then adding sufficient strong alcohol to ensure its preservation from mould. A few drops of this solution added to a colourless neutral or alkaline solution containing dissolved lead, strikes a deep mauve-blue to a red with a faint blue tinge, according to the amount of lead present. The test will distinctly indicate a tenth of a grain of lead per gallon in ordinary drinking water, and by comparison with a solution free from lead, much smaller quantities are indicated.

In searching for traces of lead in water, it is convenient to take two porcelain dishes: into the one place 100 c.c. of the water to be examined; and into the other a solution of carbonate of lime in carbonic acid water, known to be lead free, and approximatively of the same hardness as the water to be examined; then add to each an equal bulk of the colouring matter in quantity sufficient to distinctly tinge the water. The colours may now be compared, the slightest blue tint will be either due to lead or copper; for copper in very dilute solutions gives a similar tint, but in solutions of 1 to 1,000, or stronger, the hue is so different as to differentiate the two metals.

The method is within certain limits applicable for quantitative purposes on the usual colorimetric principles. As a qualitative test, it is superior to sulphuretted hydrogen, and more convenient.

Titration of Zinc by means of Sodium Sulphide. M. Schröder. (*Zeitschr. für Analyt. Chem.*, 1883, Part 4.) The author recommends thallium paper as an indicator in place of lead or cobalt paper. To prepare this paper, 1 gram thallium is dissolved in nitric acid, the excess of acid is expelled in the water-bath, and the residue is dissolved in 500 c.c. water. Filter-paper is soaked in this solution. The spots produced by sodium sulphide are brown, and are very easily perceptible. The following three conditions must be kept in mind. In the zinc solution there should be a large and approximatively equal proportion of ammonium chloride, a slight but also approximatively equal excess of free ammonia, and the zinc solution of known value used for standardising must have the same proportion of sal-ammoniac and ammonia as the liquid to be analysed.

Estimation of Zinc. L. Schneider. (*Zeitschr. für Analyt. Chem.*, 1883, Part 4; *Chemical News*, xlix. 202.) Zinc sulphate in aqueous solution containing not less than 1 gram zinc in $\frac{1}{2}$ litre water is almost entirely precipitated by sulphuretted hydrogen. The quantity remaining in solution is about 2 mg. zinc per litre. At 1.7 gram zinc per $\frac{1}{2}$ litre the precipitation is incomplete. In presence of free sulphuric acid the precipitation of zinc by sulphuretted hydrogen is perfect only when the proportion of hydrated acid does not exceed 1 c.c. per litre. Under the above-mentioned conditions as to concentration and acidity, zinc may be separated by means of sulphuretted hydrogen from iron, manganese, nickel, and cobalt. From very dilute hydrochloric and nitric solutions, zinc may also be completely precipitated by means of sulphuretted hydrogen. In accordance with these facts the author determines zinc in its ores as follows: 1 gram of the dry ore is placed in a long-necked flask with

10 c.c. sulphuric acid, and according as it is calamine or blende with 1 or 2 c.c. nitric acid, until white vapours of sulphuric acid escape. When cold, the flask is placed in a sloping position, and 70 c.c. water are cautiously added. Roasted ores, and all such as are not soluble in nitro-sulphuric acid, are first dissolved in hydrochloric acid, and then evaporated with sulphuric acid. Into the hot dilute solution is passed sulphuretted hydrogen without previous filtration, and thus copper, arsenic, and antimony, free from zinc, are precipitated. After the gas has been passed in for fifteen minutes the solution is heated to a boil, until the excess of sulphuretted hydrogen is expelled. The precipitate, consisting of the sulphides of the above-mentioned metals, with lead sulphate and insoluble ganguestone, is collected upon a filter and washed with sulphuretted hydrogen water. The filtrate, which amounts to about 200 c.c., is mixed, while hot, with ammonia to incipient turbidity. The precipitate is redissolved with a few drops of sulphuric acid, and after the solution has been diluted with water to 500 to 600 c.c., the zinc is precipitated by means of sulphuretted hydrogen.

Determination of Iron in Ores by means of Permanganate in Hydrochloric Acid Solutions. J. Krutwig and A. Cochetoux. (*Ber. der deutsch. chem. Ges.*) The authors confirm Zimmermann's observation respecting the value of manganese sulphate for counteracting the injurious influence of hydrochloric acid in this titration. They also recommend the use of but the needful amount of hydrochloric acid, the subsequent addition of sulphuric acid amounting to twice as much as the hydrochloric, the dilution of this solution with water to not less than 300 c.c., and the application of a very weak permanganate solution.

Note on the Estimation of Iron by Potassium Bichromate. Dr. E. B. Schmidt. (From a paper read before the Chemical Society, November 15, 1883.) The author states that zinc should not be used to reduce the iron, as it interferes with the end reaction with potassium ferricyanide. He prefers Kessler's method of reduction with stannous chloride. He considers the reduction with sulphite of sodium tedious.

The Determination of Chromium Sesquioxide. M. H. Baubigny. (*Chemical News*, l. 18. From *Bull. de la Soc. Chim.*) The tendency of chromium sesquioxide to combine with other bases has caused the separation of chromium in this state to be abandoned whenever the liquid contains any bases other than the alkalies properly so-called. Hence chromium sesquioxide is now separated by being converted into chromic acid. The methods employed for

this purpose are fusion with alkalis, alone or mixed with saltpetre, or the action of chlorine or bromine upon the mixture of oxides, suspended in an alkaline lye. Reynoso's permanganate method has been abandoned on account of its serious inconveniences.

Storer, in 1859, proposed the use of the following oxidizing mixture:—Chromic oxide, or its salt, whether in the state of powder or of solution, is quickly oxidized at a gentle heat in presence of nitric acid, into which potassium chlorate is projected. The conversion into chromic acid is rapid and complete.

This method is absolutely general. Not only is ignited chromic acid converted almost instantaneously into soluble chromic acid, but even chrome-iron is attacked, and that so thoroughly that the residue, when tested by fusion with sodium carbonate and saltpetre, is found absolutely free from chromium.

When the chromium is once transformed into chromic acid, its separation from the other oxides falls under the general case of the separation of acids and bases. When Storer's method has been used, the presence of oxy-derivatives of chlorine prevents this operation from being effected by ammonia or its carbonate, unless the chlorous acid has first been expelled by heat, which under certain circumstances is a tedious process.

As examples, the author gives the separation of chromium from alumina and from iron. In a concentrated solution of chromium sulphate and aluminium sulphate, he transformed the chromium into chromic acid. This process is unattended with danger when conducted in an open vessel, simply covered with an inverted funnel to prevent loss by spiriting. The strength of the acid is of little importance in case of soluble compounds, and the heat should not exceed 100° .

When the liquid is cold, the alumina is thrown down by a very slight excess of sodium bicarbonate. After standing for an hour or two it is filtered and washed with water, very slightly charged with bicarbonate. The alumina, which is at first tinted yellow, is rapidly decolorized; it is then partially dried, and the filter supported by the funnel is kept at the surface of a large volume of water, to remove the last traces of alkali. The precipitate is then dried and incinerated as usual.

The chromium is then easily separated as sesquioxide by saturating the bicarbonate with sulphuric acid, adding ammonia, and treating with a current of sulphuretted hydrogen. The reduction is easily and completely effected by raising the mixture to a boil, when it is merely necessary to filter and wash the chromic hydrate. To re-

move alkalies and alkaline salts, the precipitate is dissolved in hydrochloric acid and precipitated by ammonia whilst hot.

The separation of chromium from iron (ferricum) is conducted on the same principles.

If chromium is precipitated as mercurous chromate (Rose's method), the presence of ammoniacal salts must be avoided.

Note on Logwood as a Test for Metals. A. W. Weddell. (*Pharm. Journ.*, 3rd series, xiv. 717.) When logwood is digested with alcohol, an extract of a rich yellow colour results, and this colour is not changed on dilution with a pure, freshly distilled water. When added to ordinary samples of water, which contain calcium carbonate in solution, the yellow colour is changed to a beautiful rose red, or if a metal such as lead, copper, or iron be present, it is changed to blue.

These changes are accounted for in the following manner:—Hæmatoxylin, the ordinary colouring matter of logwood, is converted by oxygen, especially in the presence of alkalies, into an oxidized product known as hæmatein, which gives a blue precipitate with iron, lead, copper, and many other metals; or if the solution be extremely dilute, a blue coloration only. This reaction is so delicate that 1 part of lead in 100,000 parts of water is easily detected, and with care 1 part in 200,000.

On the strength of these well-known reactions the author recommends the use of logwood as a delicate general test for the detection of metallic impurities in potable water as well as in soda-water and lemonade.

Use of Boric Acid and Hæmatoxylin in Alkalimetry. A. Guyard. (*Moniteur Scientifique*, December, 1883.) The author proposes to employ the boric acid in place of the sulphuric acid as a standard easily procured in a state of purity, and by which it is easy to prepare a truly normal sulphuric acid. As indicator, he proposes hæmatoxylin. It must be dissolved in distilled water immediately before being wanted. The solution thus obtained may serve for a day, but not longer. With this indicator the distinction between strong and weak acids disappears, boric acid producing as decided a change of colour as sulphuric acid. A few drops of a weak solution of hæmatoxylin give, with any acid liquid whatever, a bright yellow colour perfectly distinct. Alkalies turn the colour to a distinct and relatively permanent purple. Hæmatoxylin is also, according to the author, one of the most delicate reagents for ammonia, and may perhaps even prove more valuable than Nessler's reagent. If traces of ammonia exist in a liquid, then, at the

moment of the saturation of an acid by an alkali, the yellow tint of the hæmatoxylin is turned to a delicate violet by the formation of hæmatein. The author considers that this reaction will be of especial value in the alkalimetric determination of nitrogen.

The Alkaline Reaction of Glass as a Source of Error in Analysis. U. Kreusler and O. Henzold. (*Ber. der deutsch. chem. Ges.*, xvii. 34.; *Journ. Chem. Soc.*, 1884, 775.) Whilst repeating Kjeldahl's experiments on the formation of ammonia by the action of sulphuric acid and potassium permanganate on organic compounds, the authors made comparative experiments with pure ammonium salts, with the result that too high a percentage of ammonia was found. The same result was observed in blank experiments when no ammonia was present, the average alkalinity (estimated as ammonia) from three experiments being equal to 2.13 milligrams of nitrogen. The authors have traced this source of error to the decomposition of the glass employed in the experiments; they have also compared different sorts of glass, namely: (1) readily fusible Thuringian glass; (2) less fusible Thuringian glass; (3) combustion tubing of very refractory Bohemian glass, and (4) more readily fusible Bohemian glass. Of these, the first is far the most readily attacked by water, the third being the least attacked, and yielding results which require no correction. The fourth is nearly as good as the third, whilst the second is more readily acted on. The alkaline reaction of glass may be easily shown by boiling red litmus tincture in a test-tube, and by other such simple experiments.

A Method for the Quantitative Separation of Potash and Soda from Ferric Oxide, Alumina, Lime, and Magnesia in Silicates. W. Knop. (*Chemical News*, xlviii. 110. From *Zeitschr. für Analyt. Chem.*) The process is carried out as follows:—The weighed substance is mixed in a platinum crucible with a few c.c. of water, and in case of need with a corresponding quantity of silica. A sufficiency of hydrofluoric acid is then added, and all the liquid is evaporated away. The dry residue is covered with 2 to 3 c.c. of fuming hydrochloric acid, upon which it is readily detached from the crucible. It is washed into a beaker by means of an alcohol washing-bottle, using 25 or at most 50 c.c. of absolute alcohol for washing out the crucible; the acid liquid is allowed to act for some time upon the precipitate. 100 c.c. of ether are then added, and the whole is allowed to stand for twelve hours.

The ethereal liquid is poured off from the precipitate, and the alkaline silico-fluorides are brought upon a filter by means of an

alcohol washing-bottle. The use of a feather is admissible only at the beginning; a glass rod is objectionable because it makes the precipitate adhere again to the inside of the glass. The precipitate may be transferred easily if the beaker is held in a sloping position over the fitter, and a few c.c. of alcohol are ejected behind the precipitate so as to wash it into the filter.

The filter is then washed slightly with alcohol, so as to remove the ether; it is then dried, the precipitate removed, the paper is burnt completely in a platinum capsule; the precipitate is added to the ash, mixed with concentrated sulphuric acid, allowed to stand for some time until the silico-fluoric gas has mostly escaped, and then ignited so long and at so low a temperature that the alkalies may remain behind as acid sulphates and be unable to react upon the silica liberated.

The residue in the capsule is drenched with 10 to 20 c.c. of ammonia, and evaporated to dryness, or at least to a paste-like condition. The mass takes again an acid condition by the loss of ammonia, and strong ammonia is therefore added, drop by drop, until the reaction is again alkaline. The mixture is then allowed to stand for an hour to allow of the complete separation of the ferric oxide and the alumina. Upon the pasty mass is then poured about 20 c.c. of a solution of ammonium monocarbonate (prepared by mixing 180 c.c. of ammonia, sp. gr. 0.92, with 230 grams of ammonium sesqui-carbonate, and water enough to make up one litre), and allowed to stand for twelve hours in the covered platinum capsule.

The quantities of ferric oxide, alumina, lime, and magnesia thus separated are so small that the entire precipitate may be collected upon a very small filter. It is washed with the smallest possible quantity of the above-mentioned ammonium carbonate.

The filtrate is now exposed first for some time to a very gentle heat, a quantity of ammonium bitartrate corresponding to the ammonium sulphate present in the solution is added, the liquid is evaporated to dryness, and the residue is heated for some time in the air-bath to a temperature above 100°. The object of adding ammonium bitartrate is to prevent spirting during the ignition of the ammonium sulphate. The residue is ignited till perfectly white, and weighed. It is then re-dissolved in hot water, mixed with 2 to 3 drops of the solution of ammonium mono-carbonate, and set aside to see if any further deposit of iron oxide and alumina takes place.

If this is the case, the liquid is again evaporated to dryness. These supplemental deposits generally attach themselves so firmly

to the platinum that a clear solution is obtained on drenching the residue with 10 to 20 c.c. of boiling water. This solution is decanted into a second platinum capsule, in which the solution is evaporated to dryness, and the capsule is again strongly ignited and weighed. It is recommended to add a few drops of sulphuric acid during this second evaporation.

Detection of Carbon Bisulphide. D. Vitali. (*Journ. de Pharm. et de Chim.*, November, 1883.) The author fills a gasometer with pure hydrogen, which he allows to traverse a series of U-tubes filled with fragments of glass or of pumice steeped in lead nitrate, silver nitrate, and caustic potash. For the same purpose fragments of pumice steeped in sulphuric acid and potassium permanganate may be used. The liquid in which carbon bisulphide is to be detected is introduced into a three-necked bottle connected to a second bottle containing tartar emetic. A current of pure hydrogen is made to pass into the former, and then into the latter. The hydrogen is then conducted into a chloride of calcium tube, after which it may be treated with reagents, or the products of its combustion may be examined. A portion of the gas is passed into a few c.c. of an alcoholic solution of caustic potash, to which are afterwards added a very small quantity of neutral ammonium molybdate and a small excess of dilute sulphuric acid. If the liquid contains traces of carbon bisulphide, it takes a rose colour, which then passes into a vinous red. Another portion of the gas is passed into a small volume of an alcoholic solution of lead acetate, to which a few drops of caustic potash are added, and the mixture is heated to a boil. If the mixture contains carbon bisulphide, lead sulphide is produced. If the quantity of carbon bisulphide is large, it becomes sensible by the smell. The flame has a blue centre, and gives off the odour of burnt sulphur. It decolorises blue starch-paper, blues starch-paper charged with iodic acid, and produces a yellow spot upon porcelain, which, if treated with caustic potash and then with sodium nitroprusside or lead acetate, gives the reactions characteristic of the presence of sulphur. If a plate of silver is used instead of porcelain, there appears a black spot of silver sulphide. If solutions of caustic potash, of lead acetate, cadmium sulphate, antimony chloride, or arsenious acid are dropped upon a porcelain plate, and the flame is allowed to spread over these points of the plate, the characteristic colours of the metallic sulphides appear. If carbon bisulphide is mixed in more or less considerable quantities with solid matters, these should be distilled along with water acidulated with sulphuric acid, and the distillate

further examined as above. If it is required to detect carbon bisulphide in coal-gas, the gasometer is filled with this gas, and the process is conducted as described.

Detection of Chlorine, Bromine, and Iodine. F. Jones. (*Chemical News*, xlviii. 296.) The process is carried on in the following way: Place a *small* quantity of the mixture to be tested in a good sized test-tube, add a few pieces of manganese dioxide, and then a little water. Add now *one* drop only of dilute sulphuric acid (one part acid to ten of water); a brown tinge indicate the presence of iodine. Boil the mixture, and confirm the presence of iodine by the violet vapours in the upper part of the tube. Continue the boiling till these vapours cease to appear, then add another drop of sulphuric acid, and boil again till they cease. If necessary, repeat this addition of acid and boiling until violet vapours have entirely ceased. Now add about two cubic centimetres of the dilute acid, and boil again; brown vapours indicate bromine. Continue the boiling until the vapours no longer smell of bromine, then add one cubic centimetre of dilute acid and boil again. When the vapours no longer smell of bromine allow the residue to cool *completely*; add an equal bulk of *strong* sulphuric acid, and warm; a green gas bleaching a piece of moist red blotting-paper at the mouth of the tube indicates chlorine.

Occasionally some bromine comes off on addition of the strong acid, but if so it is soon got rid of, and is succeeded by the chlorine, which is chiefly evolved on warming the mixture. As, moreover, moist red blotting-paper is far more quickly acted on by chlorine than by bromine, there can be no difficulty in distinguishing between the two elements.

The Estimation of Chlorine, Bromine, and Iodine in Presence of One Another. F. Maxwell-Lyte. (*Chemical News*, xlix. 3.) The author refers to a paper by P. Julius on the action of bromine and iodine on chloride, bromide, and iodide of silver, and in connection with this subject suggests the following analytical method of separation:—

The haloids having been precipitated together with silver, the precipitate is to be collected, dried, and weighed.

It is now dissolved in about thirty or forty times its weight of water by the addition of the least possible quantity of cyanide of potassium. A quantity of pure bromide of potassium is now added, which need not be above the weight of the precipitate. The cyanide is now decomposed by the addition of an excess of dilute sulphuric acid.

The precipitate, in which any silver chloride has become by this means converted into silver bromide, is now collected on a filter, dried, and weighed.

It is once more dissolved by the least possible quantity of potassium cyanide, and the same quantity of water, and to this is now added one and a quarter times the original weight of the precipitate of potassium iodide.

The cyanide is now again decomposed by dilute sulphuric acid, and the precipitate once more collected on a filter, dried, and weighed.

In this last precipitate all the silver is converted into iodide, excepting such as was iodide already. In the second experiment all became bromide, excepting such as was bromide or iodide already.

From the weights then obtained from the first, second, and third weighings, the chlorine, bromine, and iodine may easily be calculated.

Determination of Iodine in a Mixture of Iodides, Bromides, and Chlorides. A. Cavazzi. (*Chemiker Zeitung*. From *Chemical News*, xlix. 14.) From a mixture of chlorides and iodides the iodine can be isolated by a boiling solution of neutral ferric chloride, but if bromides are present bromine also is liberated. In order to remove the iodine alone from a mixture of the three kinds of haloid compounds, the author uses ferric sulphate instead of the corresponding chloride. It must be previously heated almost to redness in order to make it perfectly free from acid. As the calcined salt dissolves with difficulty in water, a little ferrous sulphate is added, which increases the solubility and renders the solution permanent. Two grams of ferric sulphate, in presence of 0.1 to 0.2 gram of ferrous sulphate, dissolve readily in 25 c.c. of boiling water. If a mixture of chloride, bromide, and iodide is boiled with this solution, the iodine alone is separated out. The author absorbs the iodine in potash, reduces iodate to iodide by means of hydrogen, which is evolved in the alkaline solution by aluminium, and precipitates the iodine with silver nitrate.

Direct Determination of Chlorine in Presence of Bromine, and of Bromine in Presence of Iodine. G. Vortmann. (*Chemical News*, xlix. 110.) The author some time back made known a method for the detection and determination of chlorine in presence of bromine and iodine, based on the various behaviour of the three halogens with manganese and lead peroxide in presence of acetic acid (see *Year-Book of Pharmacy*, 1883, p. 44). On boiling with lead peroxide and acetic acid, the chlorides remain unaffected; whilst the

bromides and iodides are completely decomposed, with liberation of bromine and iodine. Manganese peroxide, in presence of acetic acid, is said to act only upon the iodides.

C. L. Müller and G. Kircher have submitted this method to investigation. As regards the action of lead peroxide and acetic acid upon the chlorides, they found that upon boiling such mixtures chlorine is given off in abundance, along with carbonic acid, whether the acid employed was glacial or containing from 50 to 10 per cent. of real acid. One part of sodium chloride boiled for six hours with 10 parts of lead peroxide and 20 parts of acetic acid at 50 per cent. in a cohobator, was found to contain only two-thirds of the chlorine originally present. In accordance with their experiments, the authors explain this fact by the circumstance that in such proportions sodium chloride and acetic acid yield hydrochloric acid; that this in presence of lead peroxide evolves chlorine, which, reacting upon the acetic acid, forms mono-chloroacetic acid, which is in part oxidized with formation of lead chloride, carbonic acid, and free chlorine.

If manganese peroxide is substituted for the lead compound, sodium chloride is, indeed, decomposed, but carbonic acid escapes alone, without chlorine.

Müller and Kircher confirm the author's statement that lead peroxide in presence of acetic acid decomposes the bromides and iodides; whilst, according to their experiments, manganese peroxide and acetic acid act, not upon the iodides alone, but upon the bromides also.

The author has now replied in an elaborate memoir. His observations agree with those of Müller and Kircher so far that, on boiling potassium chloride, lead peroxide, and acetic acid, a perceptible escape of chlorine occurs if the concentration of the acetic acid is over 5 per cent. He finds that not a trace of potassium chloride is decomposed if acetic acid of at most 2 to 3 per cent. strength is employed, and the mixture is evaporated on the water-bath. Even on repeating this process five or six times, no loss of chlorine is experienced. The remaining chlorides behave like potassium chloride.

Concerning the behaviour of the chlorides with manganese peroxide and acetic acid, the author states that in presence of strong acetic acid a slight decomposition occurs, whilst if the acid is dilute there is not the slightest action.

The author corrects his previous statements concerning the behaviour of the bromides to this effect, that they are attacked by

manganese peroxide and strongly concentrated acetic acid, but with a dilute acid of 2 to 3 per cent. they do not undergo any change.

If the solution of a bromide is mixed with lead peroxide and dilute acetic acid, bromine is immediately liberated, especially if the reaction is assisted by heat. On boiling or evaporation, bromine escapes; so that it is practicable on repeatedly evaporating to dryness on the water-bath, entirely to expel quantities of bromine corresponding to 0.5 potassium bromide. In case of larger quantities of bromine, a twice repeated evaporation is not sufficient. The reason is that considerable quantities of lead acetate in solution impede the decomposition of the bromide, since the liquid can only be evaporated to a syrup. In such cases the repeated evaporation is dispensed with, and the dissolved lead is thrown down by means of sulphuretted hydrogen; the precipitate of lead sulphide is then again evaporated down with lead peroxide and acetic acid, when finally the last trace of bromine is driven off.

The decomposition of the iodides by treatment with lead peroxide and acetic acid is complete only when so much lead peroxide is added as corresponds with the following equation,—



and the mixture is heated for some time to boiling. In the cold no lead iodate is produced by an excess of lead peroxide; on boiling, however, the iodine is partly oxidized, and considerable quantities of lead iodate are formed, relatively to a greater extent the more iodine present, small quantities of iodine can be eliminated without oxidation. Manganese peroxide acts upon the iodides much more feebly than does lead peroxide. The decomposition in presence of acetic acid is slower, and there is no formation of iodic acid.

Mixtures of iodides and bromides in acetic solution behave with manganese peroxide like the iodides alone, i.e. iodine alone is eliminated. On applying an excess of lead peroxide, on the other hand, there is simultaneous expulsion of bromine and iodine, which then react upon each other with formation of iodic acid. This change takes place even in the cold, and almost the entire quantity of iodine can be thus converted into iodic acid, so that on heating scarcely anything but bromine escapes. The formation of iodic acid may be almost completely avoided by introducing the lead peroxide into the boiling acetic solution in small successive portions, in order thus to decompose first the iodide and then the bromide. Upon these facts the author founds the following analytical methods:

For determining chlorine in presence of small quantities of bromine, the mixture with lead peroxide and acetic acid of 2 to 3 per cent. is twice or thrice evaporated to dryness on the water-bath. The residue is taken up with water and a little acetic acid, filtered, washed with hot water, and the filtrate is precipitated with silver nitrate.

The determination of chlorine in presence of iodine is conducted in the same manner. If the quantity of the iodide is small, lead peroxide is used; but if large, manganese peroxide is preferable. The evaporation with dilute acetic acid must here also be repeated several times. The expulsion of iodine is accelerated by boiling the liquid first for a few minutes in a flask; but this procedure is practicable only with lead peroxide, as, in case of manganese peroxide, violent bumping occurs. In this case the mixture is heated on the water-bath, and a current of air is passed through the liquid.

The determination of bromine in presence of iodine is effected in an analogous manner; the mixture is repeatedly evaporated with manganese peroxide and dilute acetic acid on the water-bath, and air is passed through the liquid to expedite the reaction.

The determination of chlorine in presence of bromine and iodine can be effected by two methods: The mixture is either boiled with lead peroxide and dilute acetic acid, when the iodides and bromides are simultaneously decomposed, or the iodine is first expelled by evaporation with manganese peroxide and acetic acid, and the bromine is then eliminated by repeating the operation with the addition of lead peroxide.

If the former method is adopted, in order to obviate as far as possible the formation of iodic acid by the mutual action of iodine and bromine, the lead peroxide is introduced into the boiling acetic solution in small portions and in slight excess. After boiling for half an hour, and constantly replacing the water lost by evaporation, the lead which has passed into solution is precipitated with sulphuretted hydrogen, without previous filtration; the whole, after filtration, is heated for some time on the water-bath, again treated for a short time with sulphuretted hydrogen, and filtered. The filtrate is evaporated to dryness on the water-bath, the residue covered with dilute acetic acid, and, after the addition of some lead peroxide, again evaporated. The evaporation is in any case repeated once more, the residue is finally dissolved, and after filtration the chlorine is determined with silver nitrate.

The results are unsatisfactory when a little chlorine occurs along

with large quantities of bromine and iodine. In such cases the following procedure is to be preferred: The mixture is repeatedly evaporated down on the water-bath with manganese peroxide and acetic acid of 5 per cent. strength, to expel iodine; the bromine is then driven off by evaporating—without previous filtration—repeatedly with lead peroxide and a $2\frac{1}{2}$ per cent. solution of acetic acid; the ultimate residue is taken up with water and a little acetic acid, and the chlorine is determined in the filtrate.

This method has the defect that, on decomposing the iodides by manganese peroxide, manganese dissolves, and on subsequent treatment with lead peroxide it is reprecipitated as manganese-lead peroxide. This precipitate requires very prolonged washing with boiling water.

Detection of Traces of Fluorine in Silicates. W. Knop. (*Zeitschr. für Analyt. Chem.*, 1883, Part 4.) The finely-ground mineral is placed in a small tubulated retort, covered abundantly with sulphuric acid, and dry air is passed through, keeping the mixture at $50-60^{\circ}$. The gaseous current is caused to pass out to the bottom of a narrow glass cylinder, 20 c.m. in height, filled to about one-fourth with a solution of a few decigrams of colourless aniline in 30 c.c. of a mixture of equal parts of alcohol and ether. The current of air must be so regulated that a single bubble per second may pass through the aniline solution. The current being thus kept up for two hours, if a small quantity of fluorine were present, there is found in the lower end of the delivery-tube as far as it dips into the aniline solution a white deposit. This may be easily removed with the feather of a pen and rinsed by immersion in the liquid. On adding three drops of a moderately strong solution of caustic soda in absolute alcohol, the turbidity loses its crystalline, glittering appearance, and within a quarter of an hour a cloud of sodium silico-fluoride settles to the bottom of the cylinder. The author believes that a milligramme of fluorine may be thus distinctly recognised.

Volumetric Estimation of Phosphoric Acid. G. C. Caldwell. (*Chemical News*, xlviii. 61.) The author finds Pemberton's method efficient; he has introduced an improvement to facilitate the final test filtrations. A test-tube is fitted with a double-bored cork, through which pass two tubes, a short one bent at right angles, and a longer one bent at a convenient angle for introduction into a beaker; the bore of the tube is 1 mm., the end of the longer one has a conical enlargement or mouth, with a diameter of 5 mm. To prepare the apparatus for use a perforated platinum cone is fixed

in this mouth, and while suction is applied to the short bent tube, the mouth of the tube with the cone is just dipped into very thin asbestos pulp, and then into water, the suction being continued until the water comes through quite clear. The apparatus is now ready for use; suction is again applied, the filter dipped into the liquid to be tested, and when the desired quantity of filtered solution is obtained, the filter is withdrawn; the suction must be sustained all the time to prevent the cone and asbestos from falling out. The liquid is treated in the test-tube, and then returned to the beaker. Before the next test is made the filter and tube are washed by a small quantity of the liquid, which is drawn through the filter and returned to the beaker.

Preparation of the Nitro-Molybdic Reagent at its Maximum Concentration. A. Guyard. (*Moniteur Scientifique*, Dec., 1883; *Chemical News*, xlix. 22.) The author dissolves in a large beaker ammonium molybdate in powder or in crystals, until it is no longer taken up on stirring. The liquid thus prepared is strongly acid to litmus. He places then in smaller glasses 15 to 20 c.c. of a nitric acid made up of equal measures of the strongest acid and of water. He then pours gradually, and with constant stirring, the ammonium molybdate into the acid, until the white precipitate which is formed and disappears, renders the liquid slightly milky. It is then cleared by the addition of a drop of nitric acid, and left to become completely cold. By each such operation there are produced 125 to 150 c.c. of the reagent at its maximum concentration. It is not judicious to attempt the preparation of larger quantities in one and the same glass.

The Alleged Influence of Salts of Lead on the Detection of Phosphorus by Mitscherlich's Process. H. Beckurts. (*Journ. de Pharm. et de Chim.*, November, 1833.) The author has satisfied himself by repeated experiments that, contrary to the assertion of Schwanert in Otto's "Treatise on Poisons," the presence of lead salts is no obstacle whatever to the production of phosphorescence in Mitscherlich's apparatus.

Detection of Hydrocyanic Acid in Forensic Investigations. H. Beckurts. (*Chemical News*, xlviii. 199.) After pointing out that the presence or absence of hydrocyanic acid or poisonous metallic cyanides in the presence of a harmless cyanide is not efficiently demonstrated by treatment with tartaric acid and distillation, etc., the author recommends as efficient Jacquemin's process, namely, distilling the sample to be tested with concentrated solution of sodium hydrogen carbonate, and testing the distillate for hydro-

cyanic acid; or Barfoed's process, in which the mass is acidified with sulphuric or tartaric acid, and agitated with ether, which takes up hydrocyanic but not hydroferrocyanic acid.

The Indication of Alkalinity in the Volumetric Estimation of Hydrocyanic Acid. P. MacEwan. (*Pharm. Journ.*, 3rd series, xiv. 341.) The author states that by substituting phenol phthalein for litmus in this process, alkalinity is indicated with certainty, so that the titration may be carried through without interruption. He finds that this indicator is not affected by sodium cyanide, and if a single drop of its solution be added to the hydrocyanic acid previous to the addition of soda solution, no change occurs until the acid is wholly converted into sodium cyanide and the solution has become slightly alkaline, at which point a pale crimson appears, and no more soda is required. Titration may then be proceeded with.

In a subsequent note (*ibid.* p. 380) the author admits that the solution becomes slightly tinted before the acid is saturated, and states that the alkali ought therefore to be added in sufficient quantity to render the liquid decidedly crimson. With deficiency of alkali the colour disappears during titration.

Formation of Methylene Blue as a Test for Sulphuretted Hydrogen. E. Fischer. (*Ber. der deutsch. chem. Ges.*, xvi. 2234; *Journ. Chem. Soc.*, 1884, 109.) To test for sulphuretted hydrogen in aqueous solution, the latter is treated with one-fiftieth volume of concentrated hydrochloric acid, a few grains of paramidodimethylaniline sulphate are added, and when this is dissolved, 1-2 drops of a dilute solution of ferric chloride. In the case of a solution containing 0.00009 gram of sulphuretted hydrogen in a litre of water, coloration took place in a few minutes, and in half an hour the liquid had assumed a strong blue colour, which lasted for days. A solution of the same strength, but without hydrochloric acid, yielded only a light brown coloration with lead acetate. In a solution containing 0.000182 gram of sulphuretted hydrogen in a litre of water, the methylene-blue reaction still gave a distinct blue coloration, whilst no effect was produced either by lead acetate or sodium nitroprusside. This reaction is recommended as the most delicate and certain test for neutral or acid solutions of sulphuretted hydrogen. Paramidodimethylaniline is most conveniently prepared from helianthin, $\text{Me}_2\text{N} \cdot \text{C}_6\text{H}_4 \cdot \text{N} : \text{N} \cdot \text{C}_6\text{H}_4 \cdot \text{SO}_3\text{H}$; this is finely powdered, mixed with 5 parts of water and an excess of ammonium sulphide; the mixture is frequently agitated, and when (after about twenty-four hours) the reduction is complete the amidodimethyl-

aniline can be extracted with ether; the ethereal solution is then agitated with a little white lead suspended in water, and the filtrate treated with an ethereal solution of concentrated sulphuric acid. The ether is separated from the crystalline sulphate, and this is heated with absolute alcohol until it is converted into slender white needles, which after being washed with alcohol can be pressed and dried on a water-bath.

Detection and Estimation of Free Sulphuric Acid in Aluminium Sulphate. O. Miller. (*Ber. der deutsch. chem. Ges.*, xvi.) The author's experiments show that among all known reactions, those of methyl-orange afford, not merely the most certain means for the detection of free sulphuric acid in cake-alum, but also for its quantitative determination.

With this indicator he has been able to detect 0.01 gram of free sulphuric acid per litre along with 0.645 gram of aluminium sulphate, and even to show the dissociation of this salt on boiling its aqueous solution.

For the quantitative determination of the free acid, he extracts the sample in the cold with alcohol, evaporates the alcoholic solution at a very gentle heat on the water-bath almost to dryness, redissolves in cold water, and titrates with decinormal alkali.

Tropæoline is not affected by neutral aluminium acetate; but it is not sufficiently sensitive to free acid. Ethyl-orange is very sensitive to free acid, but takes a rose colour with neutral sulphate of alumina, so that the further change produced by free acid cannot be distinctly recognised.

Methyl-orange is exceedingly sensitive to free acid, and is coloured by pure neutral aluminium sulphate, not rose, but orange; so that the change to a rose in the presence of free acid is very distinct.

Paratoluidine Sulphate as a Reagent for Nitric Acid. A. Longi. (*Gazz. Chim. Ital.*, 1883.) If a liquid holding in solution nitrates is mixed with a few drops of paratoluidine sulphate, and a layer of sulphuric acid carefully poured on the surface, there appears at the boundary of the two liquids an intense red coloration, which passes to a dark yellow only after a considerable time. Crude aniline may be used instead of pure paratoluidine. The red coloration can be recognised in fluids containing $\frac{1}{33000}$ nitric acid. The reaction is less sensitive than that obtained with brucine and diphenylamine, but it has the advantage of producing a different colour (blue) with chloric, bromic, iodic, chromic, and permanganic acid. It can also be used for distinguishing nitric from nitrous acid, since it produces

with the latter a yellow coloration which gradually passes into red.

Volumetric Estimation of Nitric Acid. A. Longi. (*Gazz. chim. Ital.*, xiii. 482.) The method here described is based on the destruction by stannous salts of the blue colour produced by diphenylamine in a solution of nitric acid. The author employs Marignac's stannoso-stannic sulphate, of which two molecules indicate one molecule of HNO_3 .

Volumetric Determination of Nitrous Acid in Commercial Alkaline Nitrites. L. P. Kinnicutt and J. U. Nef. (*Amer. Chem. Journ.*) The sample of nitrite is dissolved in cold water, one part of the salt to at least three hundred parts of water. To this solution a decinormal solution of potassium permanganate is added, drop by drop, till the liquid has a decided and permanent red colour, then two or three drops of dilute sulphuric acid, and immediately afterwards an excess of the potassium permanganate solution. The liquid, which should now be of a dark red colour, is made strongly acid with sulphuric acid, heated to boiling, and the excess of potassium permanganate determined by means of a decinormal solution of oxalic acid.

Analyses of samples of both potassium and sodium nitrites, made in accordance with the above modification, show that results agreeing very closely with one another can easily be obtained.

Volumetric Estimation of Nitrous Acid. A. G. Green and S. Rideal. (*Chemical News*, xlix. 173.) The authors found that the formation of diazo-benzene from aniline by the action of nitrous acid, takes place quite quantitatively if sufficient time be allowed; and that on this reaction may be based a very accurate method for the estimation of nitrites. The least excess of nitrous acid remaining after the reaction is complete is indicated on adding starch and potassic iodide. The process is most conveniently conducted as follows:—

A decinormal solution of pure aniline is made containing rather more than twice its equivalent of acid, one half being sulphuric, and the other hydrochloric acid. A weighed quantity of the nitrite to be estimated is dissolved in a known volume of water, so that its strength shall be somewhere between deci- and centinormal. The amount of nitrous acid in this solution is then roughly determined by means of centinormal permanganate, or by a preliminary experiment with the decinormal aniline solution. Several experiments are then made, using the same quantity of the aniline solution in each case, but varying the amount of the nitrite solution

within the limits of the rough determination. After standing overnight the reaction will be completed. To each is then added an equal volume of a solution of starch and potassic iodide: the one in which there is a faint blue colour will show that a slight excess of nitrous acid has been added. The authors find that if the decinormal aniline solution be sufficiently diluted (with about four times its volume of water if the nitrate is about decinormal), and the nitrite run in slowly, the addition of ice is unnecessary.

The authors' experiments have shown that nitrous acid can be estimated in this way to less than 0.1 per cent., as owing to the extreme delicacy of the starch and potassic iodide test a very small excess of nitrous acid is indicated. The excess of nitrous acid does not seem to suffer much decomposition on standing overnight in the acid solution; but for very accurate results it is best to allow the solutions to stand in an atmosphere of carbonic acid or coal gas.

The authors' results were confirmed by using a standard solution of sodic nitrite, prepared from a weighed amount of pure silver nitrite.

In addition to its greater delicacy, this method can be used in many cases where, owing to the presence of oxidizable substances, the permanganate process is inapplicable.

Detection of Pyridine in Commercial Ammonia. H. Ost. (*Journ. für prakt. Chem.*, 1883, Part 6.) On partially neutralising the sample with hydrochloric acid, the pyridine is revealed by its odour. The liquid thus imperfectly neutralised may be distilled, the distillate received in hydrochloric acid, evaporated to dryness; and the alcoholic extract, after expulsion of the alcohol, precipitated with platinum chloride. After the platinum-ammonium compound has been removed, the double pyridine compound crystallizes out in smooth, ramifying, orange-red anhydrous prisms.

An Indicator of Exact Neutrality in Alkalimetric and Acidimetric Estimations. A. Gawalowski. (*Zeitschr. für. Analyt. Chem.*, xxii. 397.) The indicator proposed by the author is obtained by mixing alcoholic solutions of phenolphthalein and methyl-orange. This imparts a pale yellow colour to strictly neutral liquids, which is changed to deep red by the least trace of alkali, and to pink by a trace of acid.

The Use of Litmus, Rosolic Acid, Methyl Orange, Phenacetolin, and Phenolphthalein as Indicators. R. T. Thomson. (*Chemical News*, xlix. 32-35 and 38-41.) The author's results are summarized in the table on pp. 146 147, giving the parts by weight of base or

acid which can be estimated by standard acid or alkali in the various compounds, when 100 parts of the base or acid are present. The figures relating to the fats and fatty and resin acids are given upon the authority of Hehner and Allen. When the end-reaction is noted as "uncertain," it must be understood that the indicator is practically useless, unless specified otherwise in a note.

The Determination of Nitrogen. J. Kjeldahl. (*Chemical News*, xlviii. 101.) The author criticises the process of Wanklyn and Chapman, and proposes in its stead an oxidation in an acid solution.

The sample to be operated upon is first strongly heated with sulphuric acid; and is thus almost invariably brought into such a state that its nitrogen is completely converted into ammonia by the following operation. The principle of the process is treatment with a sufficiency of concentrated sulphuric acid at a temperature not much below the boiling point of the acid. The solution thus obtained is oxidized with an excess of dry powdered permanganate. Under these circumstances the organic nitrogen is completely transformed into ammonium sulphate; the liquid is then supersaturated with soda, distilled off, and determined according to the usual methods:

It is essential for this process that ammonium sulphate, at the high temperature applied, and especially during the subsequent treatment with permanganate, which is attended with a very violent reaction, does not undergo decomposition. This the author has ascertained by special experiments.

The procedure may be described as follows: The substance is weighed into a small, tared boiling-flask, in which the further treatment is to take place. Even with solids this is a very convenient arrangement, but still more so with liquids. A liquid is weighed in, the water allowed to fly off in the evaporation niche, when the extract remains where it is wanted. Oil of vitriol is then added in a sufficient excess. The quantity may vary within tolerably wide limits, though the author always employs 10 c.c. Great care must be taken that the acid does not absorb ammonia. The author has often found traces of nitrogen in the so-called pure acid of commerce, for which a small correction must be made. The flask is then placed upon a piece of wire-gauze over a small gas flame. As a rule the contents become black and tarry, but on continued heating a brisk reaction sets in with escape of gas, during which the substance is completely dissolved. On account of the escape of sulphurous acid and of white fumes this operation

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should be conducted under a draught hood. To prevent loss by spirting the flask should be set in a slanting position until the contents are come to rest. The flask should hold about 100 c.c. and have a long narrow neck. When the escape of gases has ceased the action of the sulphuric acid is not at an end; a slow oxidation goes on; the liquid first becoming a deep brown, then light brown, yellow, and ultimately clear as water. To accelerate this process a little fuming sulphuric acid or phosphoric anhydride is added. With these additions a heating for two hours is sufficient to give a clear light brown liquid. With the albuminoids and their derivatives the formation of ammonia is as complete after heating for one to two hours as if the liquid had been rendered almost colourless by prolonged treatment. With other substances, such as are mentioned below, the addition of phosphoric anhydride is recommended, and heat is applied until the disappearance of the colour indicates that the action of the acid is at an end. The temperature should be a little below the boiling-point of the acid, as is indicated by occasional "bumps." At temperatures of 100–150° the formation of ammonia is exceedingly imperfect. The substances for analysis do not require pulverization further than is needed for obtaining a correct average portion.

The oxidation is then effected by means of permanganate, for which no efficient substitute has been found. It is applied in the state of a fine, dry powder, which is introduced in very small portions which may quickly follow each other. The oxidation is effected in the hot liquid, though the flame is removed, and is completed in less than a minute. Although the reaction is violent and is even accompanied with small flames, there is never a loss of ammonia. The completion of the process is indicated by the appearance of a green colour. The author generally allows the flask to stand over a very gentle flame for five to ten minutes, without ascribing especial importance to this procedure. On no account must a strong heat be applied to the green liquid, as this would involve a serious loss of ammonia.

The liquid when sufficiently cool is diluted with water, when the green colour changes to a brown. When again cool it is introduced into the distillatory apparatus, which should hold about $\frac{3}{4}$ litre, and is connected with a top-piece sloping upwards with a spiral condenser leading into an absorption apparatus charged with standard acid.

The soda lye used has the specific gravity 1.30, of which 40 c.c. are rapidly introduced into the distillatory apparatus and the

stopper re-inserted. There is no perceptible loss of ammonia in this operation, and consequently no special arrangement is necessary for the introduction of the alkali.

To prevent bumping in distillation, small zinc turnings or filings are introduced before the addition of the alkali.

For substances containing about 1.5 per cent. of nitrogen, the author operates on 0.7 gram; for richer bodies, $\frac{1}{4}$ gram. The results obtained by the new method agree very closely with theory and also with those obtained by Will and Varrentrapp's process. In connection with this process, the author has obtained good results in the analysis of the alkaloids by omitting, as usually recommended, to form a channel extending along the entire combustion tubes by gentle rapping. He considers that the danger of loss by the formation of nitrogenous vapours, which are not taken up by the acid, is greater than that of the dissociation of ammonia which is so often brought forward. For further security he adds a little pure sugar to the soda-lime at the front end of the tube. Whilst the soda-lime sinks together when heated, and leaves an open way between itself and the sides of the sugar, the sugar on combustion forms a porous carbonaceous mass which fills the entire width of the tube, and through which all the gases formed by the combustion of the substance are obliged to pass.

The author, when recommending his method for organic substances in general, with a certain reserve as regards some alkaloids, admits those bodies as exceptional in which the nitrogen occurs in the form of volatile acids; such as, generally speaking, the cyanides and the oxides of nitrogen. As regards the nitrates a peculiar fact must be put on record. Whilst it might be expected that the nitric acid would be in great part volatilized by heating for hours with concentrated sulphuric acid in large excess, it is found, on the contrary, that the greater part of the nitric acid in presence of organic matter is converted into ammonia.

Estimation of Organic Nitrogen in Urine and other Liquids.
A. W. Blyth. (*Analyst*, 1884, 115.) Two grams of the urine were placed in a flask, and 20 c.c. of pure sulphuric acid added; heat was applied by means of a small flame for two or three hours, at the end of which time crystals of permanganate were added until the liquid was first decolourized, and then given a distinct dark pink or red tint. On now alkalisising with pure oxide, all the nitrogen present was distilled over as ammonia; the distillation being assisted by a current of hydrogen gas, the ammoniacal distillate was received in a known quantity of standard

decinormal acid, and titrated back by decinormal soda. The author has made a number of analyses of flour and farinaceous foods, and compared four of them with combustion processes, and the results have been very satisfactory. He has also applied it to malt extract in solution, to cocoa, to tea, and to coffee.

The scope of applicability of this method may probably be much further extended.

Estimation of Nitrogen in Manures. E. Dreyfus. (*Bull. de la Soc. Chim.*, October 5, 1883, *Chemical News*, xlviii. 225.) The author remarks that a manure may contain nitrogen in the organic form, soluble or insoluble, as ammonia, and in the nitric form. He criticises the method of Ruffe, which he finds inaccurate, and proposes the following process: The manure is intimately mixed, and a portion weighing 1 gram is taken, and placed in a small glass capsule, adding pure sulphuric acid of full strength, so as to saturate the manure, and heating the whole over a Bunsen burner. The sulphuric acid expels the nitric acid and dissolves the organic matter. When the solution is complete and the sulphuric acid begins to give off vapours, the heat is withdrawn. By this operation the manure is freed from every trace of nitric nitrogen, and there remain merely the totality of the organic nitrogen and of the ammoniacal nitrogen. When the capsule is cold finely-ground calcium carbonate is added until the resulting grey mass is absolutely dry and pulverulent. The whole is carefully detached from the glass and mixed with soda-lime for the determination of the organic and the ammoniacal nitrogen. The nitric nitrogen is then determined in a second portion by Schlösing's method. For preparing soda-lime, the author dissolves $1\frac{1}{2}$ parts caustic soda in 3 parts of water, and adds the solution to 3 parts of quicklime. To destroy any nitrates present as impurity in the soda, M. Delarge dissolves a quantity of pure sugar in the soda-lye used for slacking the lime.

Determination of Nitrogen in Nitrates and Manures. C. Mohr. (*Zeitschr. für Analyt. Chem.*, 1884, 26. From *Chemical News*.) Among the many methods proposed for the purpose of estimating nitrogen in nitrates and manurial mixtures, none has met with so much approval as the reduction process with ferrous chloride, and measurement of the nitric oxide gas, as recommended by Schlösing, Grandeau, and others. Schlösing collects the gas over mercury, and Grandeau over water. To prevent the liquid from reascending into the decomposition-flask, Munz passes a current of carbonic acid through the apparatus and absorbs it by the introduction of a small volume of

strong soda-lye. This proposal greatly facilitates the operation, since the nitric oxide gas is evolved only very slowly from the ferrous solution, so that prolonged gentle boiling of the liquid is required. Here the carbonic acid renders essential service, and makes it comparatively easy to complete the operation without accident. This method has, however, one defect: the inside of the gas burette, moistened with soda-lye, becomes very soon encrusted with crystals of sodium carbonate, rendering it difficult or impossible to read off the volume of gas. The author, therefore, employs instead of mercury or water a soda-lye of specific gravity 1.2 to 1.25. A lye of this strength absorbs the carbonic acid completely, and does not deposit crystals of sodium carbonate upon the glass. The carbonic acid passing through the apparatus disappears more and more towards the end of the process by absorption, until finally the volume of gas remains constant.

The manipulation of a gas burette with caustic soda is rather difficult. The author has therefore designed a burette with a glass tap and a small cylindrical funnel. The burette is filled by aspirating from above by means of a caoutchouc tube, and the tap is then closed.

The author has also designed an azotometer for ammoniacal salts and their mixtures. If the salt to be examined is approximately pure, a 2 per cent. solution is prepared. Of manurial mixtures 5 or 10 grams are taken to 100 c.c. A graduated pipette, holding 10 c.c. and fitted with a small glass tap and an efflux point, is filled with this solution. A decomposition flask holding 150 c.c. is charged with 50 c.c. of a solution of bromine in caustic soda; the flask is then closed with a caoutchouc stopper having two perforations, through one of which is inserted the above-mentioned pipette, whilst a gas-tube, serving as outlet, passes through the other. The latter is connected by means of a short caoutchouc tube with the gas-burette above described. The introduction of the caoutchouc tube is necessary, as, after the decomposition, the flask must be shaken in order to liberate the absorbed nitrogen. After fitting up the gas-burette and introducing the pipette, the tap is opened cautiously and 10 c.c. are allowed to flow in, drop by drop. The evolution of gas takes place quietly and without perceptible heat. After the 10 c.c. have thus run in, the apparatus is well shaken.

The Determination of Organic Impurity in Water by means of Permanganate. A. R. Leeds. (*Zeitschr. für Analyt. Chem.*, 1884, 17. From *Chemical News*, xlix. 150.) The author raises the objection that the organic matter at common temperatures is

less energetic than at 100° ; that the execution of the process is tedious, and that the distinction of the organic matter present into putrescent and non-putrescent, according to the time it is exposed to the action of the permanganate is based on an arbitrary assumption which cannot be correct. It has been proposed to prolong the time of action to twenty-four hours, but even after so prolonged reaction the decomposition of the organic matter is not complete, and no additional insight is obtained into its nature. Hence for the last five years the determination of the organic matter in water has been performed in the author's laboratory at a boiling heat, and according to the Kübel-Tiemann method. He has recently subjected this method to a very careful re-examination.

It was first ascertained what was the influence of a prolongation of the time of boiling. 100 c.c. of water were boiled with 10 c.c. of sulphuric acid (1 : 3), and the same volume of permanganate for five, ten, fifteen, and twenty minutes. In one case the action became constant at fifteen minutes; but in all the others there was a continued increase. The same water was then tried by the Schulz-Trommsdorff method, using instead of sulphuric acid 1 c.c. of a 20 per cent. soda-lye. Here also the action was progressive, and the oxidation was less energetic than with sulphuric acid. Ordinary distilled water was then examined by both methods, and here also progressive decomposition took place. Special distilled water, free from ammonia, was next tried, with corresponding results. Hence it appears that from 0.30 to 0.35 c.c. of permanganate of the strength employed are necessary to give 100 c.c. of the purest distilled water the rose tint which serves as the final indication. Hence the author concludes:—

1. The Kübel-Tiemann process must be retained. The determination must be performed exactly in the same manner, and the duration of the experiment must be exactly five minutes.

2. The results must be corrected by deducting the quantity of permanganate consumed in a blank experiment with *pure* distilled water.

Determination of Organic Matter in Water. A. R. Leeds. (*Phil. Mag.* [5], clxix. 13.) In this paper is described a process for the determination of organic matter in potable water, based upon the readiness with which metallic silver is separated from solutions of its salts by organic matter. The details of the process are as follows: To 250 c.c. of the water to be examined, 100 c.c. of decinormal silver nitrate solution are added, and the mixture allowed to stand for about two days, when the solution will have

become clear, the entire precipitate collecting at the bottom. This precipitate is washed first with ammonia, to get rid of the chloride, and then dissolved in nitric acid, the amount of silver being subsequently determined by Pisani's process.

The Action of Glycerin on some Ethereal Solutions. C. Méhu. (*Journ. de Pharm. et de Chim.*, October, 1883.) Attention is drawn by the author to the fact that aqueous glycerin solutions possess the power of removing ferric sulphocyanide, ferric chloride, chloride of gold, nitrate of uranium, mercuric chloride, and various other substances and colouring matters from ethereal solutions on agitation with the latter. He concludes from these facts that in analytical researches it will be well to bear in mind that ether will not always exercise its normal solvent power in the presence of glycerin.

A Distinctive Test for Gallic Acid. S. Young. (*Chemical News*, xlviii. 31.) When an aqueous solution of gallic acid is treated with a solution of potassium cyanide, a beautiful red coloration is produced, which, however, disappears after a short time if the liquid is not disturbed. The surface, however, remains coloured, and on tapping the test-tube in which the solution is contained, the superficial coloured portion is driven downwards into the colourless liquid below. If, now, the test-tube is shaken energetically, the colour reappears as at first, but, on standing, the liquid again becomes colourless. This alternate production and disappearance of the beautiful and characteristic red colour may be repeated as many as fifteen or twenty times, the solution finally attaining a permanent brownish yellow colour.

Pure tannic acid gives no coloration with potassium cyanide, but commercial tannic acid invariably contains a certain amount of gallic acid, and therefore the reaction is usually observed, though the colour is only feeble.

A sample of tannic acid, which gave a rather deep coloration with potassium cyanide, was dissolved in water, and to the strong solution about one-third of its volume of ether was added, and the whole shaken vigorously. After standing, three layers were formed, as described by Guibourt (*Ann. Chem. Pharm.*, 48, 359).

After evaporation of the upper ethereal layer, the light yellow residue was dissolved in water and treated with potassium cyanide, when the deep red colour due to gallic acid was produced. The middle layer was found to contain a still larger quantity of gallic acid. A drop of the syrupy brown aqueous solution of tannic acid, which formed the lowest layer, when diluted with water and treated with potassium cyanide, gave a much feebler coloration

than the original tannic acid. This process of purification was repeated four times, the gallic acid reaction, both in the case of the upper ethereal layer and the syrupy tannic acid solution, becoming weaker each time, until at last the cyanide produced no coloration whatever.

It thus appears that tannic acid free from gallic acid is not coloured by potassium cyanide, which reagent therefore affords by far the most convenient means of distinguishing those two acids. Moreover, the presence of a very small quantity of gallic acid in tannic acid is indicated by this means.

Recognition of Genuine Beechwood Creasote. H. Hager. (*Chemical News*, xlviii. 9, from *Zeitschr. für Analyt. Chem.*) Pure beechwood tar creasote is not soluble in double its volume of anhydrous glycerin, but forms therewith a milky-white or whitish mixture, which ought not to be coloured. Other creasotes dissolve in double their volume of glycerin. To detect phenol, 3 vols. of a 75 per cent. glycerin are mixed with one vol. of the suspected creasote and well shaken. On settling there are formed two strata: a turbid one below, and a lighter layer. The latter consists of the creasote which has given up its proportion of phenol to the lower stratum, its volume becoming smaller according to its proportion of phenol. In order fully to remove the latter (at least up to 98 per cent.) from the creasote, the upper layer is again shaken up with three times its volume of 75 per cent. glycerin as before. On shaking up with ammonia (of 5 per cent.), the phenol passes into the latter, whilst the beech-tar creasote remains undissolved. If the sample is mixed with an equal volume of soda-lye of sp. gr. 1.334, it should form a clear yellow permanent liquid, a slight degree of heat being liberated. One vol. of beech-tar creasote dissolves completely and clearly in 2 vols. of petroleum benzene, and the solution should be almost colourless or yellowish. Creasote containing even 5 per cent. of phenol or creosol gives a turbid mixture. The solution of the creasote in petroleum benzene is divided into three parts. The first is shaken up with an equal volume of liquid ammonia, the second with caustic soda-lye of sp. gr. 1.160. In neither should a dark coloration appear in the course of half an hour. The third portion is shaken up with an equal volume of baryta-water. No blue, violet, or red colour should appear in either stratum of the liquid. Such colours would indicate tar-constituents, which should not be present in creasote. If 1 vol. creasote is shaken up with 2 vols. of a 15 to 18 per cent. ammonia, a genuine pure sample takes, at most, a lemon-yellow colour in the

course of half an hour, and the upper aqueous stratum is pale or yellowish. Equal volumes of creasote and collodion should form a mixture which remains colourless for half an hour.

The Determination of Phenol in Creasote Oils. Dr. Kleinert. (*Zeitschr. für Analyt. Chem.*, 1884, 1-13.) The author's experiments were undertaken with the object of testing the value of Koppeschaar's method, and led to the following conclusions:—

1. All the creasote oils examined yielded upon distillation the smallest fractions between 150–200° C., and could therefore but contain very small quantities of phenol.

2. As carbolic acid boils at 184–185° C., the fraction distilling over at a higher temperature than 200° may fairly be assumed to contain none or the merest traces of this substance; and yet it is in the fractions obtained between 200–250°, which form the greater part of the distillate, that the greatest percentages of phenol are found by Koppeschaar's method.

3. The acid oils also contain bodies boiling above 250° C., which show the same behaviour towards bromine as phenol.

From all this it follows that the percentage of phenol as determined by Koppeschaar's method, consists to a great extent of other bodies contained in the acid oils, are soluble in water, and have a higher boiling point than phenol.

Detection and Estimation of Picric Acid. G. Christel. (*Ber. der deutsch. chem. Ges.*, xvi. 1396.) When lead acetate is added to a solution of 1-20th mgrm. of picric acid in 5 c.c. of water, a strong opalescence is at first produced, and later a faint or sometimes distinctly yellow precipitate. In order to detect the presence of picric acid in beer, the latter is evaporated to a syrup, extracted repeatedly with alcohol, the residue, after evaporation of the alcohol, treated with sulphuric acid, and extracted with ether, which takes up the picric acid. The quantity is estimated by adding potassium cyanide to a solution of the acid, whereby phenylpurpuric acid (iso-purpuric acid) is formed, and comparing the depth of colour with that produced in a solution of picric acid of known strength.

A New Reaction for Thymol and Phenol. J. F. Eykman. (*American Drugg.*, 1884, 85.) If a small crystal of thymol is dissolved in about 1 cubic centimetre of glacial acetic acid, and this solution mixed with about one-fifth its volume (5 to 6 drops) of concentrated sulphuric acid, a fine blue colour is produced by allowing one drop of nitric acid to flow down to the bottom of the test-tube. On shaking the whole liquid acquires this blue colour.

In presence of not too small a quantity of thymol, the liquid appears dichroic, being red by transmitted, and dark blue by reflected light.

Phenol differs from thymol in this reaction, by causing the appearance of a fine violet-red colour.

Salicylic, menthol, camphol, and borneol give no colour-reaction under the above conditions.

Detection of Iodoform, Chloroform and Naphthol in Animal Fluids. S. Lustgarten. (*Zeitschr. für Analyt. Chem.*, 1883, Part 3. *Chemical News*, 1883, 170.) A very small quantity of sodium-phenol (or of resorcine) is placed at the bottom of a very short test-tube. One to three drops of the alcoholic solution is then added, and the tube is warmed cautiously over a small flame. In a few seconds there appears a red coating at the bottom of the tube which dissolves in a few drops of dilute alcohol with a carmine colour. In applying this test to urine, the author distils about 50 c.c., mixes the neutral distillate with potash, and shakes it up with ether in a separating-funnel. The ethereal extract is dried at a common temperature, and the residue taken up with a few drops of absolute alcohol. Blood is treated in a similar manner, but alkali should be added before distillation, and the ethereal extract should be mixed with a few drops of sulphuric acid in order to fix bases. For the detection of naphthol the author utilises its behaviour with chloroform in presence of alkali. If α - or β -naphthol is dissolved in strong potash, mixed with chloroform, and heated to 50°, a rich blue liquid is obtained, which on exposure to the air passes first to a green and then to a brown. With acids the blue solution turns to a red. For the detection of naphthol in urine, the author acidifies strongly with hydrochloric acid, distils off about one-half, and extracts the naphthol from the distillate with ether. The residue on the evaporation of the ether is dissolved in potash, and serves for the application of the test. The distillate may be advantageously treated with animal charcoal at a gentle heat. The same reaction serves inversely for the detection of chloroform.

Vanadium Sulphate as a Reagent for Alkaloids. K. F. Mandelin. (*Ber. der deutsch. chem. Ges.*, xvi. 2323.) The author recommends vanadium sulphate most strongly for the detection of strychnine, and states that the stability of the reagent proves to be very satisfactory. (It is prepared by the trituration of colourless ammonium vanadate with sulphuric acid.) The reaction with colchicine and colchicine is, however, only reliable when the

sulphate is freshly prepared. The reactions described in the earlier communication were obtained with a solution of 1 part of ammonium vanadate in 200 parts of the monohydrate of sulphuric acid. With the same quantity of dihydrate, similar reactions were observed in some cases, different ones in others, while sometimes no reaction at all was produced.

In the *Pharm. Zeit. für Russland*, 1883, 22, R. Mandelin proposes a solution of 1 part of ammonium vanadate in 100 parts of sulphuric acid as a reagent for strychnine. A trace of the alkaloid, brought in contact with a few drops of this reagent upon a watch-glass, causes a momentary splendid blue coloration, rapidly changing into violet and vermillion. The blue coloration is evident with 0.001 mgrm. of strychnine.

Note on the Reaction of Quinine with Chlorine Water and Potassium Ferrocyanide. A. Vogel. (*Zeitschr. für Analyt. Chem.*, 1884, 78.) The author states that this well-known test for quinine succeeds best if bromine water be used instead of chlorine water, and suggests as a further improvement that the ammonium carbonate usually added after the ferrocyanide, should be replaced by sodium phosphate or borax.

Separation of Morphine in Forensic Investigations. E. Scheibe. (*Chemical News*, xlvii. 217.) The substance is extracted with acidified water, the solution concentrated to a syrup, and extracted with ordinary alcohol. From the filtrate the alcohol is removed by distillation, and the colouring matters got rid of by shaking with amyl alcohol. The solution is now made alkaline, again shaken with amyl alcohol, and the solution of the alkaloid evaporated to dryness.

The residue is extracted with water slightly acidified, and the acid solution, after being rendered alkaline with ammonia, is shaken with absolute ether and alcohol (10 to 1.) On evaporation, the morphine is obtained free from all colouring matters which might otherwise mask the characteristic reactions.

The Opium Test of the German Pharmacopœia. Dr. Geissler. (*Pharm. Centralhalle*, 1883, Nos. 16 and 19; *Pharm. Journ.*, 3rd series, xiv. 645.) The author has critically examined the method of opium assay of the German Pharmacopœia, and arrives at the following conclusions:—

The method of the German Pharmacopœia does not separate the morphia completely.

The morphia separated is at least not always pure.

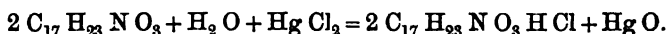
The results are not uniform.

These objections may be urged against every method of estimating morphia that has yet been proposed, but the process of the *Pharmacopœa Germanica* leaves more in solution than others do, and yields a less pure morphia. To comply with its requirements an opium must contain 12 to 13 per cent. of morphia.

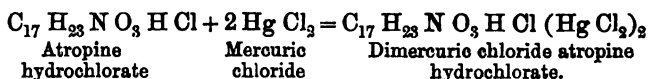
In his concluding remarks, the author expresses his approval of Mylius's volumetric estimation of morphia, but hopes soon to perfect a gravimetric method based upon the solubility of morphia in ammonia.

A New Reaction and Test for Atropine. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, xiv. 718.) Whilst studying the behaviour of atropine towards mercuric chloride, the author found that on mixing hot alcoholic solutions of the two substances they gave a yellow precipitate, which on boiling became red. On diluting the mixture with water, a further amount of yellow precipitate was obtained, which also changed to red on boiling.

The precipitate separated, washed, and dried, was found on analysis to be mercuric oxide, with a small trace of mercurous oxide. The reaction representing the first change can be shown by the following equation,—



In addition to the above reaction, the author finds that a second one takes place simultaneously. This second reaction is between the atropine hydrochlorate and two more molecules of the mercuric salt, yielding the following combination :—



On cooling and setting aside a few hours, this compound separated in tufts of crystalline plates.

For practically working the test, the author recommends the following procedure: To a small portion of atropine in a test tube, add about 2 c.c. of a 5 per cent. solution of mercuric chloride in 50 per cent. alcohol, and warm gently; the precipitate will at once appear, and become brick-red in colour. Like most alkaloidal reactions, there are certain limiting conditions necessary for the success of the test. It does not answer in dilute solutions, neither does it turn out well if the atropine be added to the mercury, but working as the author has described, the reaction is strongly marked.

A New Method for the Determination of Urea. L: Hugou-nenq. (*Comptes Rendus*, xcvi. No. 1.) The urine is filtered through animal charcoal, then diluted with water, and heated to 140° in a sealed tube. The ammonium carbonate formed is then determined by titration, using as indicator the coal-tar colour known as *Orange No. 3*. The numbers obtained agree very fairly with those obtained by the hypobromite process. This method may be applied to albuminous urines if the albumen is previously coagulated by heat. It is not available in such as contain glucose or magnesia in notable quantities.

A Colorimetric Process of Estimating Gluten in Flour. L. Reed. (*Chemical News*, xlviii. 63.) The principle upon which the estimation is based is the production of a yellow nitro-body when nitric acid acts upon albuminoids. 0.5 gram of flour is weighed out and carefully transferred to a test tube, which is divided (beginning at the bottom and ending the graduation about half way up) into four parts of equal capacity; water is now to be added up to the fourth mark exactly, and the test-tube violently shaken, being closed by the thumb. Frothing is best avoided if the shaking be terminated by successive inversions of the tube; the contents are temporarily transferred to another dry test-tube whilst the marked one is cleaned (all the pourings out are to be done immediately after shaking). A quarter of the liquid is now poured back, viz., up to mark 1, and the tubes filled up to mark 3 with nitric acid of strength such that half a test-tube full of it appears white, when a white surface is observed vertically through it, but the acid should, barring this condition, be as strong as possible. The test-tube is now made to stand exactly five minutes, with occasional shaking up, and is then to be filtered immediately after shaking through a dry filter into a dry receptacle; a standard flour is then to be treated in the same way, and the two clear yellow solutions examined colorimetrically; the qualities of the flours are then inversely as the heights of equal colour.

Estimation of Starch in Cereals. C. O'Sullivan. (*Chemical News*, xlviii. 244.) The method may be briefly described as follows: The finely ground grain is successively extracted with ether, alcohol (sp. gr. 0.90), and water at $35-38^{\circ}$. The starch in the washed residue is gelatinised by boiling with water, cooled to 63° , and converted by diastase into dextrin and maltose. If a quantitative determination of these two products be made, the starch originally present can be calculated. The author describes the method as follows: About 5 grams of the finely-ground flour

are introduced into a wide-necked 100 c.c. flask, and just saturated with alcohol, sp. gr. 0·82; 20–25 c.c. of ether are added. After standing several hours, with occasional shaking, the ethereal solution is decanted through a filter, and the residue in the flask washed with ether. To the residue 80–90 c.c. of alcohol, sp. gr. 0·90, are added, and the mixture warmed to 35–38° for a few hours; the alcoholic solution is then decanted through the same filter, and the residue washed with alcohol, sp. gr. 0·90, at 35–38°. The residue in the flask and on the filter is washed into a 500 c.c. beaker, and the beaker filled with water. In about twenty-four hours the solution is decanted through a filter, and the residue washed with water at 35–38°. The residue in the beaker and on the filter is washed with a short camel-hair brush and a fine jet, into a 100 c.c. beaker. The whole is then boiled for a few minutes in the water-bath, with constant stirring, to gelatinise the starch; the beaker and its contents are cooled to 62–63°, and about 0·03 gram of diastase added; the digestion at 62° is continued for an hour. The solution is then boiled for eight to ten minutes, filtered into a 100 c.c. measuring flask, the residue carefully washed with successive small quantities of boiling water, and the whole made up to 100 c.c. at 15·5. The ether frees the grains from fat, etc.; the alcohol (0·90) removes the sugars, albuminoids other than casein, etc., whilst water at 35–38° dissolves out the amylams. Dextrin and maltose are the sole products of the action of diastase on starch. The diastase is prepared as follows:—2 to 3 kilos. of finely-ground pale barley malt are mixed with sufficient water to saturate and cover the whole. After standing three or four hours the mass is squeezed with a filter-press. If not bright the liquid is filtered. To the clear solution, alcohol, sp. gr. 0·83, is added as long as a flocculent precipitate falls; as soon as the supernatant liquid becomes milky, the addition of alcohol is discontinued. The precipitate is washed with alcohol, 0·86–0·88, dehydrated with absolute alcohol, pressed, and dried *in vacuo* over sulphuric acid until its weight is constant. Diastase thus prepared is a white, friable, easily soluble powder, which retains its activity for a considerable time. 5 grams of barley flour thus treated with 0·03 gram diastase gave 100 c.c. at 15·5°, having sp. gr. 1·01003, which represents 25·39 grams of solid matter (taking 1·00395 as the sp. gr. of a solution containing 1 per cent. of starch products), 9·178 grams of this solution reduced 0·241 gram of cupric oxide, and 200 m.m. of it gave a deviation in the Soleil Wentzke-Scheibler saccharimeter of 21·1 divisions. Thus we have 0·241

gram $\times 0.7256 = 0.1748$ gram of maltose in 9.178 grams; in the 100 c.c., or 101.003 grams, there are 1.923 gram of maltose; 1 gram of maltose in 100 c.c. gives a deviation in 200 m.m. of 8.02 divisions, and 1 gram of dextrin in 100 c.c. gives 11.56 divisions. So $1.923 \times 8.02 = 15.422$, the optical activity of the maltose; and $21.1 - 15.422 = 5.678$, the optical activity of the dextrin. Therefore, in 100 c.c. there are—

$$\frac{5.678}{11.56} = 0.491 \text{ gram of dextrin.}$$

We have, therefore, in the 100 c.c.: maltose, 1.923 gram; dextrin, 0.491 gram; diastase, 0.03 gram = 2.444 grams out of 2.539 solids, as indicated by the sp. gr. Of this deficiency of 0.095 gram, 0.083 proved to be α -amylam which had not been washed out. 1 part of starch yields 1 part of dextrin, and 1.055 of maltose. The starch represented by the above numbers is, therefore,—

$$\begin{array}{l} \text{Dextrin} = 0.491 \\ \text{Maltose} \frac{1.923}{1.055} = 1.822 \end{array}$$

or a total of 2.313 grams of starch from 5 grams of barley. Barley thus contains 46.26 per cent. of starch; a second experiment gave 46.38 per cent. The author gives many other determinations in detail. Barley malt contains 39.9 per cent., wheat 55.4; wheat malt, 43.26 and 43.53; rye, 44 to 46; rice, 75 to 77; maize, 54 to 58; oats, 35 to 38 per cent. In some experiments the author estimated the starch in a sample of pure starch containing 89.36 per cent. of dry starch. He obtained 89.72 per cent. and 89.54 per cent. The author states as the result of his experience with the method, that the difference in results obtained by any two observers need not exceed 0.5 per cent. of the total starch.

Analysis of Soils. A. Guyard. (*Bull. de la Soc. Chim.*, April 20, 1884. From *Chemical News*.) The mineral products useful as plant-food, and which require to be determined in the analysis of soils, exist mainly in two forms: in a state readily assimilable in the mineral portion, and in an assimilated state in the organic portion. In order to obtain the former in a separate state, the author treats in the cold 100 grams of the soil with a refrigerated mixture of 150 c.c. of hydrochloric acid with an equal volume of water. He filters and washes at first with cold water, and then with boiling water until it is exhausted, and in the solution he determines lime, magnesia, alkalies, and phosphoric acid. He thinks

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it advisable not to reduce samples of soil to an impalpable powder, and, on the other hand, that stones, etc., should be broken up, ground, passed through the same sieve, and mixed with the rest of the sample. To obtain the assimilated elements, he ignites 100 grams of soil at as low a heat as possible, stirring until all the carbon is burnt off. This portion, when cold, is treated with 300 c.c. of dilute hydrochloric acid, and exhausted as above.

Wine Analysis. J. Moritz. (*Zeitschr. für Analyt. Chem.*, 1883, Part 4; *Chemical News*, xlix. 200.) The author determines total acidity with decinormal alkali, using rosolic acid as indicator; extract by the direct process; ash in the usual manner; glycerin according to Neubauer and Borgmann's method; alcohol by means of Geissler's vaporimeter, after a preliminary distillation; phosphoric acid by the uranium method in the ash of 100 c.c. of the sample; sulphuric acid direct in 50 c.c. of the wine after acidification with hydrochloric acid; specific gravity by means of Westphal's balance, and polarisation with Wild's polaristrobometer in a tube of 200 mm. in length.

Note on the Estimation of Fixed Oils and Fats, with Special Reference to Milk. A. C. Abraham. (*Pharm. Journ.*, 3rd series, xiv. 512.) The principle of the author's method consists in the maceration of the substance under examination in the solvent suitable for extracting the fat, then taking half or a known portion of the total liquid resulting, determining the amount of fat therein, and calculating from this the amount contained in the whole.

The following directions are given for the assay of linseed meal (crushed linseed): A tube is taken of about 1 inch in diameter and 14 inches in length, contracted at the neck and stoppered; in it is placed 100 grains of linseed meal, and upon this is poured 2,000 fluid grains of spirit of wine, less such an amount as will approximately represent the volume of the oil contained in a genuine and fair quality sample of the meal. The tube is now shaken to enable the spirit to expel all the air from the meal; and when this has taken place the tube is graduated at the point at which the liquid stands. It is now ready for use. When it is desired to estimate a sample, 100 grains of the meal are inserted, and ether added until it reaches the mark; it is then stoppered or corked, and occasionally shaken during a sufficient time, when, if any loss has taken place by evaporation, or the volume has been apparently diminished by the loss of air from the meal, it is made up to the original point, again shaken, and set aside. When it has completely subsided, 1,000 fluid grains of the clear supernatant liquid are removed with a

pipette, evaporated, and weighed as usual. By doubling the product so obtained, the amount of oil, together with such other matters contained in the meal as are soluble in ether, is arrived at.

The details of the process as applied to milk are as follows:—

A 1000 grs. specific gravity bottle is filled with the milk, the weight taken which gives the specific gravity. This is emptied upon 250 grs. of powdered glass or hydrated sulphate of calcium, and the flask either weighed or rinsed out with a few drops of distilled water, although practically neither is necessary, as the amount of milk adhering to the flask when once found will be practically constant for all samples (unless sour). The milk taken is to be evaporated to dryness with the glass and thoroughly powdered, when it is to be introduced into a tube; 2,000 fluid grs. of ether added from a pipette, so as to avoid loss by evaporation; the tube stoppered, shaken occasionally during some hours, after which 1,000 fluid grs. may be removed, dried, and weighed. This must not simply be doubled, as an allowance must be made for the fat dissolved by adding to the weight found one-ninth (the sp. gr. of butter fat being about .900), deducting this from 1,000, and calculating the whole amount present by simple proportion, thus,—

Fat found, say	.	.	.	.	.	.	.	9
Add one-ninth	.	.	.	.	.	.	.	$\frac{1}{10}$
								10

∴ 990 fluid grs. of ether took up 9 grs. of fat, how much would 2,000 take up?

$$990 : 2000 : 9$$

$$\frac{11 \times 200}{10}$$

18.18 total fat present.

The difference between the amount which would be arrived at by simply doubling the weight found, and that obtained as above, will never amount to more than about .005 per cent.

Determination of Fat Acids in Oils. C. E. Schmitt. (*Monit. Scientifique* [3], xiv. 205; *Analyst*, 1884, 125.) Nearly all vegetable oils are subject, more or less, to fermentation, and the fermentative action causes fat acids to separate from glycerin with the formation of free acidity. When the oil is used for soap-making or wool-cleaning, the presence of the fat acids has little or no deleterious effect; but when used for machinery, the case is different, as they act on the metal bearings in a similar manner to mineral acids, although less violently.

The process used for the estimation of fat acids is that of Burstyn,

and is based on the property possessed by strong alcohol of dissolving the fat acids, while neutral fats are not perceptibly soluble.

The process is carried out by shaking up 100 grams of the oil with 100 grams of 90 per cent. alcohol. The alcohol separates from the oil, carrying with it the fat acids. By means of a separating funnel the alcohol layer can easily be removed, and 20 c.c. titrated with normal alkali.

The acid obtained corresponds to sulphuric acid; this, multiplied by 5, will give the total quantity of acid as oleic acid.

A dispute having arisen about some oil purchased by a house in Lille, the author was led to examine Burstyn's process.

A portion of the alcoholic solution, equal to about 20 c.c., was evaporated, and dried at a temperature of 100–105° C., until the weight became constant. The following oils were tested:—

	Burstyn's Process.	By Weight.
Sweet Almond Oil	·37	·28
Pure Olive	·514	·600
Acid Olive	6·83	6·
" "	9·23	10·15
" "	12·70	13·
French Rape Seed Oil . .	·85 to ·90	·65 to ·90
Bombay " " "	·75	·25
Dunkirk Codfish	·677	·422

The process of Burstyn may, therefore, be considered to give satisfactory results, although it is clear that alcohol dissolves volatile acids which are lost by evaporation and also colouring matters which have no action upon an alkaline solution. Volatile substances tend to give gravimetric results lower than those by Burstyn's process, while colouring and odorous substances give higher results, as they have no action on standard alkali.

In titrating, the author has found that turmeric gives more satisfactory results than either litmus or phenolphthalein.

Soap Analysis. Dr. Filsinger. (*Chemiker Zeitung*, April 17, 1884. From *Chem. and Drugg.*) The author recommends the following scheme of quantitative analysis:—

1. *Water*.—In the case of hard soap, 5 grs. scraped from the sides and centre of a new section must be first very gently warmed, so as to avoid direct melting; then over a water-bath, and finally in a drying-box at a temperature 100° C., until the weight remains

constant. Before each weighing the soap must be cooled in a desiccator over sulphuric acid. Soft soap, of which 10 grs. are taken, is spread in a thin layer over a large watch-glass, and treated in the same way.

2. *Free Fats*.—Soap containing free fat has a peculiar oleaginous feel, and yields a milky solution with water. The dry residue from 1 is finely powdered, and washed on a filter three or four times with lukewarm petroleum ether; the filtrates are collected in a beaker of known weight, evaporated, dried, and weighed.

3. *Free Alkali*.—The residue from 2 is digested for a short time with alcohol (95°), slightly warmed, filtered, the residue on the filter washed with warm alcohol, the filtrate coloured with a few drops of a solution of phenolphthalein, and titrated with sulphuric or hydrochloric acid.

4. *Foreign Bodies fraudulently added*.—These are found together with the chlorides, sulphates, and carbonates of the alkalies, in the residue on the filter from 3.

5. *Fat Acids*.—The neutralised alcoholic solution from 3 is mixed with water in a moderate-sized porcelain dish, the alcohol evaporated, the fat acids precipitated by the addition of sulphuric acid, and after melting and settling 5 grs. of dry wax is added. When the whole is cool, the solid crust of fat-acid wax is removed, washed with water and alcohol, dried without melting, and weighed. The weight - 5 gr. = the quantity of fat acids.

6. *Glycerin*.—The liquid from the cake of fat acid is treated with a small excess of barium carbonate, heated, filtered, the filter washed with hot water, and the filtrate evaporated to dryness. The residue is repeatedly washed with alcoholic ether, the filtrate evaporated in a porcelain dish, dried at a temperature of 70° C., and weighed.

7. *Total Alkali*.—Ten grs. of a fresh portion of soap, prepared as in 1, is dried in a platinum-dish, and then heated till all the fat acids have been destroyed. The porous carbonaceous residue is boiled with water, filtered into a $\frac{1}{4}$ -litre flask, and the filter washed with hot water until the washings cease to give an alkaline reaction. The flask is then filled with water up to the mark, the whole well mixed, and 25 c.c. (1.0 soap) of the limpid liquid are titrated with sulphuric acid. The result represents the amount of total alkali, and deducting from this the percentage of free alkali found by process 3, this gives the percentage of alkali in the soap combined with fat acids, carbonates, and silicates.

8. *Chlorine*.—The neutral solution is mixed with one or two drops

of a solution of potassium chromate, and titrated with a $\frac{1}{10}$ solution of silver. From the amount of silver solution used is deducted a quantity equivalent to that required for retitrating the sodium hydrate solution, and the remainder represents the percentage of chlorine present in the soap tested.

9. *Silicic Acid*.—Seventy-five c.c. of the filtrate from 7 are supersaturated with hydrochloric acid, evaporated to dryness, and the residue washed and weighed.

10. *Sulphates*.—The filtrate from 9 is boiled, and while boiling, barium chloride is added, the precipitated barium sulphate washed, dried, and weighed, and calculated for potassium or sodium sulphate. The filtrate is evaporated with an excess of hydrochloric acid, dried with caustic baryta, the barium precipitated with ammonium carbonate, the whole dried, and after volatilization of the ammonium chloride, the total percentage of the chlorides of the alkalies determined.

11. *Potash and Soda* are determined, in the usual way, with platinum chloride. Carbonates are found by a direct determination of carbonic acid in a fresh portion of soap.

Detection of Blood upon Garments which have been Washed. C. HUSON. (*Comptes Rendus*, Oct. 19, 1883. From *Chemical News*.) When linen stained with blood has been thoroughly washed, it is difficult to detect the characteristic elements. When the microscope and the spectroscope have detected neither hæmoglobin nor hæmatin, it would be imprudent to reckon upon the discovery of fibrin. But it may be important to show the care which the accused has taken to wash one part of a garment more than another. Water does not generally suffice to remove every trace of blood; the spot requires to be soaped, and when it is not afterwards rinsed with abundance of water, the linen or the garment generally retains traces of soap, which may be recognised without interfering with the search for crystals of hæmatin hydrochlorate. The author, having cut off a portion of the tissue at the suspected part, puts it in a watch-glass, and moistens it with a few drops of distilled water. The whole is kept for two hours on the sand-bath at about 40°, a drop of water being occasionally added to prevent drying up. The swatch is then pressed with small forceps, and the liquid which flows out indicates by its colour if crystals of hæmatin may be expected. This water is evaporated drop by drop on a slip of glass which serves for microscopic observation. If the liquid is too much spread out upon the glass, the residue is scraped and carefully brought to the centre of the slip, where it is

retained by means of a drop of a solution of potassium iodide or chloride at 1-100th. The same portion of the tissue is put back in the watch-glass, and treated with a small quantity of glacial acetic acid, which, after being pressed out, is evaporated upon the first residue with the precautions laid down above. Having placed a disc of thin glass upon the residue, glacial acetic acid is introduced by capillarity between the two glasses. It is heated to boiling and let cool, care being taken to slope the glass slightly; so that the liquid which has not evaporated may collect at one of the angles of the thin glass cover. If there is still hæmatin, the crystals of the hydrochlorate will appear. If there is soap, we find yellow drops of oleic acid along with margaric acid, which crystallizes in characteristic needles, more or less curved. They appear first in the form of an elongated C. If there is much soap these needles unite, and form hairy dendriform masses. If there is but little, they unite two by two, or in small fibrous tufts, which have a certain resemblance to fibrin fixed upon the fragments of the tissue. This similitude of form, though remote, may mislead. Filaments of fibrin, seen with the microscope without crystals or rays of hæmatin, do not seem a sufficient proof of the presence of blood. When the washed spot is large enough, a second portion may be cut off, boiled in distilled water, the liquid filtered through a very small filter, evaporated down, and ignited in a platinum capsule. The residue is taken up in a drop of distilled water, which turns the edge of a slip of red litmus paper blue. Both the acid and the alkali of the soap are thus demonstrated.

Peptone. A. Poehl. (*Journ. Chem. Soc.*, 1883, 926.) Peptone prepared from blood serum and fibrin is identical in its properties with peptone from egg albumen. It is thrown down from neutral solutions by alcohol in the form of a white precipitate. Dried at 100° it forms a slightly yellow brittle mass, soluble in cold water. The solution is not changed by boiling. Peptone is not precipitated by the addition of potassium ferrocyanide and acetic acid, but is completely precipitated from moderately concentrated neutral solutions by neutral salts. Tannin produces a brown flocculent precipitate in neutral or slightly acid solutions, but not in alkaline solutions. Millon's reagent produces in neutral or slightly acid solutions a brown precipitate, which turns red on warming. By the putrefaction of peptone, *ptomopeptone* is produced; it differs from peptone in that it has no action on polarised light, is not precipitated by basic lead acetate, and is decomposed by potash with formation of trimethylamine,

and by sodium hypobromite with evolution of nitrogen. Peptone can generally be detected in the urine of fever patients. Animal tissue (e.g., of the lungs and kidney) converts blood serum and fibrin into peptone at a temperature of 35° : papain, the leaves of *Carica papaya*, and other vegetable tissues, have the same property. The artificial formation of peptone only takes place in the presence of a small quantity of free acid. Peptone is gradually transformed into albumen by the action of dehydrating agents, such as alcohol and neutral alkali salts. In the first stage of the reaction it exhibits the properties of Meissner's β -peptone, and is precipitated by acetic acid and potassium ferrocyanide. In the next stage it is precipitated by nitric acid (Meissner's α -peptone). After the action has continued some time, the product is no longer soluble in cold water (Meissner's metapeptone); and in the last stage the product gives with neutral salts a precipitate which dissolves in hot water, but separates again on cooling (Meissner's *para*peptone, *pro*peptone of Schmidt-Mülheim, *hemialbuminose* of Kühne.)

Ptomopeptone does not exhibit these changes when treated with dehydrating agents.

The specific rotation of peptone is $[\alpha]_D = -14.479^{\circ}$ when $q = 0$ (q is the percentage of water in the solution) and $[\alpha]_D = -63.779^{\circ}$ when $q = 100^{\circ}$, i.e., for an infinitely dilute solution. The specific refraction of peptone $\frac{n-1}{d} = 0.4212$ when $q = 0$, and 0.3316 when $q = 100$. No change in specific gravity, rotatory power, or index of refraction takes place in the conversion of albumen into peptone; hence the author regards the change of albumen into peptone as merely a transformation into a more soluble modification.

Behaviour of Elastin in Peptic Digestion. J. Horbaczewski. (*Zeitschr. für Physiol. Chem.*, vi. 330-345. From *Journ. Chem. Soc.*) Little has heretofore been known on this subject, the view obtaining in most of the text-books being that elastic tissue is not acted on by the digestive fluids.

Recently, however, J. Etzinger has made the observation that the ligamentum nuchæ of the ox is, in the course of ten days, almost completely dissolved by pepsin and 0.3 per cent. solution of hydrochloric acid.

The author's experiments, conducted also with elastic tissue prepared from the ligamentum nuchæ (cervical vertebral ligament) of the ox, show that this comports itself similarly to albumen in peptic digestion, and yields similar products in the reaction. The

elastin obtained in the end by repeated purification of the tissue employed, details of which are given by the author, was found to be absolutely free from sulphur, and to yield on ultimate analysis the following percentage results,—

C, 54.32; H, 6.99; N, 16.75; Ash, 0.51.

The products of digestion are two substances, which are separable one from another. One of these, to which the name *hemilactine* is given by the author, is precipitable from its aqueous solution by acetic acid and potassium ferrocyanide, also by freshly precipitated plumbic hydroxide and ferric acetate, and behaves somewhat like the hemi-albumen of Salkowski, or the propeptone of Schmidt-Mülheim. The other exhibits properties similar to those of albumen peptone, and is not precipitated by potassium ferrocyanide and acetic acid. It is named *elastin peptone* by the author. As regards ultimate analysis, very little difference is perceptible between hemi-elastin and elastin, as the following results concerning the former show,—

C, 54.22; H, 7.02; N, 16.84; Ash, 0.48 per cent.

Elastin peptone yielded the following percentage composition,—

C, 53.57; H, 8.075; N, 16.20.

Other details of the properties and reactions of these respective substances are given in the paper.

By simple heating with water at 100° in a closed vessel for about twenty hours, elastin is changed into elastin peptone. Schultze had previously described the process with superheated steam as essential for this transformation.

In regard to the physiology of digestion, it is therefore now shown that elastin is digestible, and doubtless capable of absorption; although not holding any prominent position among the constituents of nutritive substances, it nevertheless must be included with those, and in the form of sarcolemma, neurilemma, and the muscular sheaths, apart from its occurrence in larger amount in the ligaments and walls of vessels, is widely distributed, and a digestible constituent of animal food. The author had an unusual opportunity of testing the digestibility of elastin in the case of a patient under the care of Albert, in the Surgical Clinique, Vienna, who had a gastric fistula. A small bag of closely woven silk, containing 1 gram of elastin powder, was introduced into the stomach through the fistula, and its digestion watched. In twenty-

four hours two-thirds of the elastin had disappeared, some swollen pulpy elastin remaining behind. This was diluted with water and filtered. The clear solution showed the reactions of hemielastin.

Diastatic Ferment of Bacteria. J. Wortmann. (*Zeitschr. für Physiol. Chem.*, vi. 287-329.) The author's results are summarized in the following conclusions:—

1. Bacteria are capable of acting on starch, whether in the solid state, as paste, or in solution, in a manner analogous to diastase.

2. As in the case of diastase, different kinds of starch are attacked by bacteria with different degrees of rapidity.

3. The action of bacteria on starch is manifested only in the absence of other sources of carbon nutriment, and when access of air is not prevented.

4. The action of bacteria on starch is effected by a ferment secreted by them, and which, like diastase, is soluble in water, but precipitable by alcohol.

5. The ferment acts precisely as diastase in changing starch into a sugar capable of reducing cupric oxide, but not possessed of peptonizing properties.

6. The ferment itself is also capable of acting on starch in the absence of oxygen.

7. The ferment is secreted by bacteria also in neutral solution of starch, and exerts its influence under these conditions.

8. This influence is expedited in slightly acid solutions.

The author concludes his paper with speculations as to the conditions under which bacteria are capable of generating this amyolytic (diastatic) ferment, instead of the ordinary peptonizing one.

Fermentation of Cellulose. H. Tappeiner. (*Ber. der deutsch. chem. Ges.*, xvi. 1734-1740.) Finely divided cotton-wool or paper is introduced into a flask [containing a neutral 1 per cent. solution of extract of meat. The vessel is heated at 100°, and when cold a small quantity of the contents of the pancreas is added. Fermentation begins in a few days: the gases evolved consist mainly of marsh-gas and carbonic anhydride. These two gases are in the ratio 1 to 7·2 at the beginning of the process, but the carbonic acid afterwards diminishes to the ratio of 1 : 3·4. The actual figures are:—

	Commencement.			End.
CO ₂	} 85·48 . . 76·98
H ₂ S.	.	.	.	
H	0·03 . . —
CH ₄	11·86 . . 23·01
N	2·73 . . —

Acetic and isobutyric acids are the chief products of the fermentation, 5·5 grams of cotton-wool yielding 5·8 grams of volatile acids. Acetaldehyde is also formed. Cellulose undergoes similar fermentation in the first stomach of ruminants and in the alimentary canal of herbivora. When the preceding experiments are varied by rendering the meat-extract feebly alkaline, by adding Nægeli's solution (potassium phosphate 0·2 gram, magnesium sulphate 0·04, gram, and calcium chloride 0·02 gram), or a solution containing in addition to the above salts 0·35 per cent. of ammonium acetate, 0·3 acetamide, or 0·6 asparagine, the following results were obtained :—

	0·5 per cent. Solution of Meat Extract.	Asparagine.	Acetamide.
CO ₂ . . . }	55·39 . . .	86·47 . . .	78·14
H ₂ S . . . }			
H	42·71 . . .	5·73 . . .	13·68
N	1·90 . . .	7·80 . . .	8·18

No difference could be detected in the bacteria in the two kinds of fermentation. In addition to aldehyde, isobutyric and acetic acids, a small quantity of ethyl alcohol appears to be formed by the "hydrogen" fermentation of cellulose.

Alcohol, aldehyde, and acetic acid are produced during the fermentation of hay. The gases evolved contain—

CO₂, 51·15; H, 44·58; CH₄, 0·9; N, 4·18 per cent.

Metalbumen and Paralbumen: A Contribution to the Chemistry of Encysted Fluids. O. Hammarsten. (*Zeitschr. für Physiol. Chem.*, vi. 194–226; *Journ. Chem. Soc.*, 1883, 874.)

Metalbumen.—This name was given by Scherer in 1852 to a proteid substance which he had discovered in the fluid of an ovarian cyst. In 1864 Eichwald, in his monograph on the "Colloid Degeneration of the Ovaries," ascribed metalbumen a place between serum-albumen and peptone, being, like paralbumen, a transition stage between the two, but more nearly allied to peptone. Metalbumen is not, as stated by Méhu (*Arch. Générales de Méd.*, ii. 1869), precipitable by magnesium sulphate, whilst paralbumen, under certain circumstances, may be. The author describes processes for the separation of metalbumen and paralbumen, which are preferable to those of Plósz, inasmuch as by employing fractional precipitation by alcohol they are obtained free from albumen. Analysis in the case of metalbumen yielded these results :—

	C.	H.	N.	S.	O.	Ash.
I	{ 49.44 . 7.11 . 10.30 . — . — . —					
	{ 49.45 . 6.91 . 10.26 . — . — . 1.1					
II.	50.0 . 6.84 . 10.27 . 1.25 . 31.54 . 1.4					

He considers metalbumen more closely related to mucin than to albumen, and that the name *metalbumen* being misleading, that of *pseudomucin* might be provisionally bestowed upon it.

In his treatise on "Colloïd Degeneration of the Ovaries," Virchow pointed out that when the colloïd tumour becomes cystic a softening of the colloïd substance is effected. Recollecting that he also showed that the alkaline solution of the colloïd substance is no longer precipitable by acetic acid, the presumption is great that Scherer's metalbumen is only a changed and liquefied colloïd.

Paralbumen.—This was also discovered by Scherer in ovarian fluid. It corresponds with metalbumen in many of its reactions, but differs chiefly in this, that in boiling, as also after the addition of certain reagents, which fail to throw down metalbumen, but only make the solution opalescent or milky, paralbumen is precipitated. It is probable that paralbumen is a mixture of pseudomucin with varying quantities of albumen. The author prepared it by addition of albumen to metalbumen (pseudomucin), and analysis confirmed the same view, affording varying results, as follows:—

	C.	H.	N.	S.
1.	50.20 .	6.79 .	11.22 .	—
2.	50.94 .	6.92 .	12.00 .	1.75
3.	51.80 .	6.93 .	12.84 .	1.66
4.	— .	— .	13.46 .	1.80
5.	52.34 .	7.19 .	14.52 .	—

According to the author's experience, his observations are in accordance with those of Hoppe-Seyler, that paralbumen is only a mixture of a mucoid substance, *pseudomucin*, with varying proportions of albumen, chiefly serum-albumen. So far as he has found, ovarian fluids contain no specific albumens—the so-called metalbumen and paralbumen—but only very small quantities of peptone, varying amounts of globulin and serum-albumen, besides a never-failing constituent in the form of a substance allied to mucin, which he has provisionally termed, as above stated, *pseudomucin*. It is to this substance that ovarian fluids owe their peculiar property: when it is found almost free from adherent albumen, then we have Scherer's metalbumen; on the other hand, when the proportion of albumen is greater, the reactions are those of Scherer's paralbumen.

Certain Reactions of Albumen. E. Grimaux. (*Comptes Rendus*, May 26, 1884.) Albumen in dilute solution is converted by the action of heat into a body which possesses the properties of the albuminates, closely bordering upon those of caseine. If solutions of albumen containing 1 per cent. of dry matter are heated to 90° for some minutes, a few flocculi separate, but the clear filtrate does not become turbid on boiling; but by the action of carbonic acid in the cold it gives a gelatinous precipitate, which redissolves in a current of air.

Formation of Uric Acid in the Animal Economy. A. B. Garrod. (*Proc. Roy. Soc.*, xxxv. 63-65.) The author has determined the solubility of uric acid and its more important salts at the temperature of the healthy human body, and has investigated the action of ammonium and sodium urates on their chlorides and phosphates, when mixed with each other in various proportions. Observations were also made on the composition of urinary excretions of the lower animals, whereby it was shown that in the semi-solid urines of birds, reptiles, and invertebrata, the urate is in the form of spherule aggregates, consisting of a number of smaller spherules, united with or contained in colloid cells.

The author lays stress on the varying amounts of uric acid excreted by different animals in relation to the elimination of nitrogenous substances, and the excessively large excretion of uric acid by birds, reptiles, and invertebrata as compared with the weight of their bodies. Thus a bird throws out relatively to its weight a thousand times more uric acid than a man.

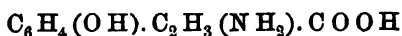
It is also shown that whereas in the kidneys uric acid exists as an ammonium salt, in the blood and different tissues it exists as a sodium salt.

The results of the investigation show that uric acid is not, as hitherto supposed, formed in the animal body during the metabolism of its various organs and tissues, then thrown into blood, and after filtration through the kidneys eliminated from the system; but that it is absolutely formed in the renal organs by the action of peculiar cells, in which it probably exists as the urate of a compound ammonium, readily decomposed into uric acid and ammonia. As such it is secreted, or the ammonium may be replaced by sodium or, under abnormal circumstances, by some other metal. At times it is deposited as a crystalline sodium salt in the cartilaginous and fibrous tissues. Experiments were made also on the decomposition of uric acid by hippurates and benzoates. Glycine, glucose, and glycerol have no such effect.

Formation and Decomposition of Tyrosine in the Body. H. Blendermann. (*Zeitschr. für Physiol. Chem.*, vi. 234-264; *Journ. Chem. Soc.*, 1883, 876.) Tyrosine is a product of the decomposition of albuminoids, from which, as well as from allied substances, it may be formed by the action of acids or alkalis at a boiling temperature, and also by the influence of certain ferments, especially the trypsin of the pancreas. The constant association of tyrosine in such decompositions of albumen makes it *à priori* probable that it is also formed in the animal body on the breaking up of proteids. This fact has already been established by Kühne and others. The proportion of proteid which is thus changed into leucine and tyrosine, to that which is absorbed from the alimentary canal as peptone, is variable and dependent on several conditions, particularly upon the rapidity of the absorption process, and the circumstances more or less favourable to an abundant development of putrefactive ferments. The question as to whether tyrosine is to be regarded as a normal product of tissue-change in healthy organs is an open one. Virchow long ago referred its presence to cadaveric changes; Naunyn, Neukomer, and others had found it in pus, and lately Leyden discovered it in the sputum of a girl suffering from hæmoptysis. Tyrosine has been abundantly found in pancreatic juice; but according to Kühne, not in the *fresh* secretion. Huber found it in normal organs, especially in fresh spermatic fluid; and he meets Virchow's statement by the results of experiments which show that on free access of air, cadaveric decomposition of albumen yields neither leucine or tyrosine. Radziejewsky's researches are, however, opposed to these views of Huber's. Hoppe-Seyler has expressed himself of all investigators most decidedly against the occurrence of tyrosine in the normal organism during life. According to him, it is a pathological product of cell-albumen, and occurs when too limited quantities of oxygen are conveyed to the tissues. Thus formed, it may under certain conditions pass away in the urine. Tyrosine is found in the organs in different diseases, almost always together with leucine, and often in considerable quantities. Frerichs has found it in the liver and in the bile, in small-pox and typhus fever; Frerichs and Städeler in acute atrophy of the liver; Scherer in the liver of a drunkard dying of typhus; Huber in the spleen, liver, and kidneys of leukæmia; and Sotnischewsky in the lungs in pneumonia. In cases of phosphorus poisoning, tyrosine has been found in the liver, kidneys, and blood, by various investigators. Pouchet asserts that it is further present in traces in healthy urine, and numerous observations accord it,

with or without associated leucine, a place in the urine in various disorders. In the urine of acute yellow atrophy of the liver, tyrosine with leucine would appear to be constantly present; but less frequently in the urine in cases of phosphorus poisoning, although all observers agree as to its presence in the liver and other organs. In other diseases tyrosine is rarely present in the urine. Anderson has, however, asserted the contrary. Several observations have quite recently been made regarding the fate of tyrosine in the system. Schultzen and Nencki found increased secretion of urine after administering tyrosine to dogs, and conjectured that this substance might be a transition stage in the formation of urea from the physiological destruction of tissue in man. Brieger found that after giving tyrosine the excretion of phenol-sulphonic acid was enormously increased. The researches of Baumann have established the presence of certain aromatic bodies in the normal urine of man and other animals, which, according to his investigations and those of Brieger and Weyl, are derived from the breaking up of albumen or of tyrosine.

The relations of these aromatic bodies to tyrosine may be readily shown. The now established formula of the latter is—



(amido-hydroparacoumaric acid). From it by putrefaction are formed hydroparacoumaric acid, $\text{C}_6\text{H}_4(\text{OH}).(\text{CH}_3)_2\text{COOH}$; parahydroxyphenylacetic acid, $\text{C}_6\text{H}_4(\text{OH}).\text{CH}_2.\text{COOH}$; paracresol, $\text{C}_6\text{H}_4\text{Me}.\text{OH}$; and phenol, $\text{C}_6\text{H}_5.\text{OH}$. The occurrence of phenol in the urine had been observed by Städeler, Lieben, and others; but its origin was referred to certain of the vegetable constituents of food, previously to Baumann showing that it was likewise present in the urine of flesh-fed dogs, and that it is a constant putrefactive product of albumen. Brieger also showed that phenol, with other aromatic bodies, is a constant constituent of faecal matters. One must, with Baumann and Brieger, regard albumen as the only source of phenol and paracresol in these cases. In harmony with this view are the numerous observations of Brieger on the occurrence of phenol in various diseases; also those of Salkowsky, including an increased excretion of phenol after ligature of the gut. The author also found the same increase in a case of severe intermittent fever. Weyl first proved that phenol and paracresol are formed by the putrefaction not only of albumen, but likewise of pure tyrosine. Baumann obtained hydroparacoumaric acid and parahydroxyphenylacetic acid from the putrefaction of

pure tyrosine, the last-named acid being also obtained by E. and H. Salkowsky from putrid albumen. Both of these acids were further decomposed by septic ferments, and yielded paracresol and phenol.

The experiments on the putrefaction of albumen and tyrosine thus cited afford simple and clear views of the relations of the substances occurring in urine to tyrosine. Experiments regarding the excretion of phenolsulphonic acid, and also of the aromatic hydroxy-acids in artificial digestion of tyrosine have not yet been made, save the important observation of Brieger to the effect that in man the administration of tyrosine is followed by an increased excretion of phenol. In the author's experiments an attempt has been made to determine the fate of tyrosine in the system. The formation of yet another substance from tyrosine was also held in view, hydroxymandelic acid, which hitherto has only once been found by Schultzen and Riess, and which undoubtedly stands in close relation to tyrosine, having the formula $C_8H_8O_4$. Baumann did not succeed in finding it among the products of the putrefaction of tyrosine. Tyrosine was introduced into the system in these experiments in two ways: either formed in the system itself by phosphorus poisoning, or administered by the mouth.

Administration of Tyrosine in the Food.—In the several series of experiments carried out upon dogs, men, and rabbits, the author found the following bodies in the urine, which may be regarded as products of its transformation:—

1. Phenols in large quantities (man, rabbit).
2. Normal hydroxy-acids in increased quantity (dog, rabbit).
3. Tyrosine hydantoin (rabbit).
4. Hydroxyhydroparacoumaric acid (rabbit).

Those named in 3 and 4 appear only in the urine of animals when saturated, so to speak, with tyrosine; so that it is readily explicable why these should be absent from normal urine. Under 2, the absence of hydroxy-acids in man is remarkable. An interesting accordance is observable between the results of administration of tyrosine and of phosphorus poisoning in the dog, in both instances there being increased formation of normal hydroxy-acids and absence of more than mere traces at most of phenol. The author concludes his paper with notes on the detection of tyrosine in the urine. This has hitherto depended upon its separation by the Frerichs-Städeler method. The reactions for the identification of tyrosine are especially those of Hofmann (red coloration with Millon's test) and of Piria-Städeler, in which the sulpho-acid of

tyrosine is formed, which, in neutral solution, gives a blue colour with ferric chloride. This latter test can only be made with pure tyrosine, and the former gives similar reactions with other bodies present in normal urine, such as phenols and hydroxy-acids. Other unknown constituents of urine also give reactions with Millon's test.

From these considerations he regards Anderson's observations, referred to at the outset of this paper, with distrust. He has further to this end examined the urine of patients in the Charité Hospital under the care of Ehrlich and Brieger, including two consumptives, a case of pneumonia, of acute articular rheumatism, hydatid of the liver and carcinoma of the liver, without in any case finding tyrosine, much less leucine, in the usual way, although Millon's test, as in the case of normal urine, gave reaction. Hoppe-Seyler has also failed to detect tyrosine in a long series of severe cases of typhus fever and other diseases.

Alteration of Cane Sugar in the Human Stomach. W. Leube. (*Bied. Centr.*, 1883, 427.) 100 c.c. of a 10-15 per cent. cane-sugar solution were introduced into an empty stomach seven hours after a previous meal, or in the morning before the subject had eaten, the stomach having been previously rinsed and the rinsings tested with Trommer's test to negative reaction. Half an hour after introducing the sugar, there was no reaction, or very trifling, whereas in a known unhealthy stomach the reaction was considerable. The explanation appears to be that in the healthy stomach the inverted sugar is absorbed, which is not the case in the unhealthy one. The gastric juices of both healthy and sick persons cause the inversion of cane sugar equally outside the body, but if a solution is introduced in equal parts in the stomachs of living subjects, and withdrawn half an hour afterwards, the difference in the reducing power is most marked, the healthy stomach showing no reaction, whilst the unhealthy does very strongly.

Paraxanthine, a New Constituent of Human Urine. G. Salomon. (*Zeitschr. für Analyt. Chem.*, 1883, Part 4.) The body described by the author under this name differs from xanthine, hypoxanthine, and guanine by its crystalline characters and its insolubility in solution of soda, by which it is precipitated from its aqueous solution in minute rectangular plate. It fuses at 270°C ., and is readily soluble in hot water, with which it forms a perfectly neutral solution.

Compounds of the Creatinine-Group. E. Duvillier. (*Comptes Rendus*, xcvi. 1583-1585. From *Journ. Chem. Soc.*)

Methylamido- α -caprocyamidine, $\text{C}_8\text{H}_{15}\text{N}_3\text{O}$, is obtained by mixing

N

cold concentrated solutions of methylamido- α -caproic acid and cyanamide in equivalent proportions, adding a few drops of ammonia, and allowing the liquid to stand. After some weeks the liquid becomes converted into a mass of white crystals, and these are purified by crystallization from water. This caproic creatinine forms an unctuous powder, only slightly soluble in cold water, but more soluble in hot water, and very soluble in hot or cold alcohol.

Ethylamido- α -caprocyamidine is obtained by the action of cyanamide on ethylamido- α -caproic acid. It crystallizes in long needles, which are somewhat soluble in cold water, much more soluble in hot water, and very soluble in alcohol.

As in the case of methylamido- α -butyric and methylamidoisovaleric acids, the action of cyanamide on methylamido- α -caproic and ethylamido- α -caproic acid yields creatinines without any intermediate formation of creatines.

α -Oxybutyrocyamine hydrochloride, $C_5H_{11}N_3O_3, HCl$, obtained by dissolving α -oxybutyrocyamine in hydrochloric acid, forms an uncrystallizable syrup, soluble in all proportions in absolute alcohol. The *sulphate*, $(C_5H_{11}N_3O_3)_2, H_2SO_4 + H_2O$, forms crystals resembling those of potassium sulphate. They are somewhat soluble in water, and slightly soluble in alcohol. Mercuric chloride and mercuric nitrate give no precipitate with solutions of α -oxybutyrocyamine, but a white precipitate is formed on adding a drop of potassium hydroxide solution.

Chemistry of Food. J. Bell. (*Proc. Roy. Soc.*, xxxv. 161, 162; *Journ. Chem. Soc.*, 1883, 1160.) The author has carried out a series of researches on butter, cheese, milk, the cereal foods, bread and lentil flour.

Butter.—It is indicated that the soluble and insoluble fatty acids in butter fat do not exist as simple, but as complex glycerides, palmitic and oleic acids being combined in the same molecule as butyric acid.

Cheese.—The ratio of soluble to insoluble fatty acids in the fat extracted from cheese is the same as that in milk fat. This result is at variance with the view maintained by some chemists that albuminoids are slowly converted into fat.

Cereals.—The author suggests that the saccharine matter appears to have been developed or determined only in aqueous extract, without regard to the transformations effected by the soluble albuminoids on the saccharoses and carbohydrates. These albuminoids are shown to possess a varying diastatic action on starch, that of rye being the most, that of rice the least active.

Milk. E. Duclaux. (*Comptes Rendus*, xviii. 438-441, and 526-528.) The author deals chiefly with the different states in which casein exists in milk, and distinguishes between *colloidal casein*, *casein in suspension*, and *soluble casein*. For details we must refer the reader to the original article.

Antiseptics. P. Miquel. (*Moniteur Scientifique*, February, 1884.) The author has drawn up a table of the minimum proportions capable of preventing the putrefaction of 1 litre of beef broth neutralised. The most powerful agent is mercury biniodide, which is ten times as active as chlorine. Salicylic and benzoic acids, phenol and arsenious acid occupy relatively very low ranks. The smallest quantities required are mercury biniodide, 0.025 gram.; chlorine, 0.25; salicylic acid, 1.00; phenol, 3.00; arsenious acid, 6.00; naphthaline has no antiseptic action.

Action of *Aspergillus Glaucus* on Lemon Juice. T. L. Phipson. (*Chemical News*, xlix. 198.) Lemons which are placed damp in a cupboard give out after a certain time a very strong odour of ether, which coincides with the development of *Aspergillus glaucus* upon them. When this microphyte penetrates into the interior, or covers the surface of a section of the fruit, the juice on being expressed has also a very strong flavour of ether.

Citric ether may exist in lemon juice, as acetic ether, for instance, is known to exist in the sap of certain other plants. But citric ether has a very different composition from acetic ether, inasmuch as it contains three equivalents of ether to one of acid; and on being decomposed by *Aspergillus glaucus*, two of these equivalents are probably set free.

Under the influence of warmth and moisture some of the sugar of the ripe lemon is *fermented*, and the *alcohol* formed immediately combines with the citric acid so abundant in the juice. Citric ether (tri-ethyl citrate) is thus produced, which, under the continued influence of the *Aspergillus*, is split up into free ether and carbonic acid (with, probably, some intermediate products), so that as the action proceeds ether is volatilised into the air around. In warm weather three or four lemons will thus diffuse a very marked odour of ether through the air of a large room which has remained closed for a few days.

In spite of their well-ascertained anti-fermentative properties, both citric and salicylic acids will in time succumb to the action of microphytes. Salicylate of lime in solution in water to which dust has access develops a white microphyte in a few months at ordinary summer temperature, abundant filaments of which will be found covering undissolved crystals of this salt.

Physiological Action of Paraldehyde, and Contribution to the Study of Chloral Hydrate. V. Cercello. (*Gazz. Chim. Ital.*, xiii. 172.) The action of this substance is hypnotic and similar to that of chloral, excepting that it does not diminish the pressure of the blood, unless administered in large doses. The sleep which it produces is calm, and not accompanied or followed by disturbances; in fact, it is similar to normal sleep. Paraldehyde is absorbed by the stomach, rectum, and subcutaneous tissue. The author supposes that it acts on the cerebral hemispheres, and then on the *medulla oblongata* and spinal marrow. He recommends it for medical use as an excellent substitute for chloral.

Preparation of Pure Chlorophyll. A. Tschirch. (From a paper read before the Chemical Society, December 20, 1883.) The author states that chlorophyll is very unstable, being decomposed by acids and alkalies. He has prepared it by reducing chlorophyllan with zinc dust. The chlorophyll so obtained gives a spectrum identical with that given by living leaves.

Constitution of Chlorophyll. E. Schunck. (*Chemical News*, xlix. 2.) The author extracts leaves with boiling alcohol, and after some time filters; the filtrate is mixed with its own volume of ether and two volumes of water; it then forms two layers, which are separated. The lower layer is yellow, and reduces Fehling's solution. The upper layer is green, and contains all the chlorophyll; it is thoroughly washed free from everything soluble in water. When the ether is evaporated the bright green residue, dissolved in alcohol and treated with alcoholic potash, does not reduce Fehling's solution, but if it is previously treated with concentrated sulphuric acid in the cold, or if its alcoholic solution is boiled with hydrochloric or sulphuric acid, the alcohol driven off, the residue treated with water, filtered, and the filtrate made alkaline, mixed with Fehling's solution and boiled, the usual glucose reaction is obtained. The glucose or glucose-like substance is a pale-yellow gummy compound. The author, therefore, concludes that chlorophyll is either a glucoside or is associated with a glucoside.

Chlorophyll. A. B. Griffiths. (*Chemical News*, xlix. 237.) The author calls attention to the presence of crystals of ferrous sulphate in proximity to the chlorophyll granules in certain plants, and suggests that probably iron enters into the constitution of green chlorophyll, and that perhaps chlorophyll may consist of a complex molecule of iron and this glucoside. He points out that no green chlorophyll is produced in plants growing in soils or other media free from iron, and explains the value of ferrous sulphate as

manure by saying that the iron most probably acts as food for the chlorophyll granules, and the sulphur as food for the protoplasm of the cells, etc.

Function of Tannin in Plants. E. Kutscher. (*Bied. Centr.*, 1883, 713.) The plants selected by the author for his investigation were *Vicia faba*, *Helianthus tuberosus* and *annuus*, *Ricinus sanguineus*, and *Phaseolus multiflorus*. He arrives at the conclusion that tannin takes part in the formation of and primary differentiation of the tissues, but does not take part in the further growth of the cell-walls. The most feasible use attributed to this substance is in aiding respiration.

Occurrence of Salicylic Acid in the Cultivated Varieties of Pansy and in the Violaceæ generally. A. B. Griffiths and E. C. Conrad. (*Chemical News*, xlix. 146.) The authors have extracted colourless acicular crystals from pansy leaves, etc., soluble in ether, alcohol, and boiling water, which gave with ferric chloride a violet colour. A combustion gave numbers agreeing with the formula of salicylic acid. The leaves yielded 0·13 per cent., the stems 0·08 per cent., the roots 0·05 per cent., whilst the flowers contained only a trace. The author cut sections of the leaves, etc., but failed to discover any crystals of salicylic acid in the cells.

MATERIA MEDICA AND PHARMACY.

PART II.

MATERIA MEDICA AND PHARMACY.

Aconite Root. E. R. Squibb. (*Ephemeris*, March, 1884, 502.)

The description of the Pharmacopœia applies very well indeed to some parcels of aconite root, but there are few drugs which, while retaining a general form, vary more in size, colour, and thickness of bark, in different parcels met with in the markets. The roots in the same parcel vary very much also in size, surface, and internal structure. Many roots in every parcel will not be over 1 to $1\frac{1}{2}$ inches in length, and while a large proportion are very much wrinkled longitudinally, a few are quite smooth. These smooth roots are absent entirely from some parcels, and are not very numerous in any. They break with a solid, starchy fracture, and commonly have a very thin bark. The wrinkled roots are more spongy internally, and some are very light and porous, doubtless from having been in a very succulent condition when gathered. All these varieties may be very strong or very feeble to the taste, for the appearance bears very little relation to the activity of the root. Some parcels are much more stalky than others; that is, have more of the comparatively inert stalk cut off with the root, and in this are of course objectionable, yet many parcels that are quite stalky are to be preferred to those which are better trimmed, on account of superior activity. The greatest difference, however, in different bales is in the taste, or rather in the aconite impression upon the tongue and lips, and upon this the writer has long relied in selecting for purchase. Some years ago he published the method of testing by taste, and at that time stated that, with care in selection, parcels could be had which when each root of a handful sample was broken in the middle, and a very small piece from the point of fracture was chewed between the front teeth in contact with the tip of the tongue for a few moments, and was then discharged, eight out of ten of the roots would give the characteristic aconite tingling in some degree within ten or fifteen minutes. He can

now state that parcels are easily had, though at a higher price, every root of which will give a strong sensation from a very small particle. This has made him revise the test within the past two years. As it comes from shipboard, or from storehouses, it is commonly tough enough to be cut across with a sharp knife without going to dust as it does when dry. A very thin slice cut across from the middle of the root will weigh about a centigramme, or a little over one-sixth of a grain. This, if cut in ten pieces of nearly equal size, each will weigh about a milligramme, or the sixty-fifth of a grain. One of such pieces, taken between the front teeth and chewed in contact with the tip of the tongue with saliva enough to wet it, for about one minute, should give the aconite impression, not strongly and not amounting to tingling, but yet a distinct impression which, when realised a few times, will always be recognised. There is no need of this cutting and weighing more than once, and that only to see how small a piece to take for the test, and there is a great advantage in taking so very small a piece, because the impression from it is so faint that it soon passes away, and admits of another root being tested in the same way in half an hour or so. If the piece be larger and the impression strong, it will last for two hours or more, and thus only a very few pieces can be tested in a day. At best it is a slow process, but well worth applying in the interest of accurate medication by a drug so important. Few pharmacists or physicians ever see the root, but only get the powdered root. The powder should be tested in the same way, taking about the same quantity on the tip of the tongue, and bruising and softening it with the teeth, so as to get out the active principle.

Aconite root is not sweetish, as described by the Pharmacopœia, but is distinctly bitterish; but the taste proper is always faint. Some roots are tasteless, or so nearly so that no very distinct taste is recognised, and yet such roots may in a few minutes give a very decided impression.

Baycuru Root. F. A. Dalpe. (*Amer. Journ. Pharm.*, 1883, 361.) The author has made a chemical examination of this root, showing it to have the following composition:—

1. Moisture. . . . 8.5 per cent.
2. Ash 9.66 per cent. sulphates,
chlorides, and phosphates
of sodium, potassium, mag-
nesium, and calcium.
3. Benzene extract . . 3.88 per cent. resin, wax, and
colouring matter.

4. Alcoholic extract. 16.4 per cent. alkaloid, tannin (12.15 per cent.), resin (1.66 per cent.).
5. Aqueous extracts. Infusion, 8.66 per cent. gum; decoction, 9.89 per cent. glucose, gum.
6. Volatile principle. Volatile oil (trace).

Note on Galangal. (From a report by Mr. Acting-Consul Jordan on the Trade of Kiungchow, *Pharm. Journ.*, 3rd series, xiv. 8.) Galangal, which is the rhizome of *Alpinia Galanga*, is brought over from Hainan on the peninsula of Lei-chou, and from How Sui and Tam-chou on the west coast of this island. The article from the peninsula is far superior to that grown on Hainan. The former is cultivated on the slopes of hills about thirty miles distant from Hainan, while the latter grows in a state bordering upon wildness, and is quite unsuited for the home market. The quality of galangal depends upon the age of the plant and the care which has been taken in drying the roots. Roots of ten years' growth are considered the best; but of late years, owing to a good demand for the article both at home and in the Hankow market, such qualities are rarely obtainable. The galangal now placed on the market is seldom of more than four or five years' growth, and prices have consequently declined. When taken out of the ground the root measures from 3 to 4 feet in length, and 2 to 3 inches in thickness; it is cut at once into small pieces and dried by exposure to the air. To give it a good appearance for the market, the Chinese use red earth for colouring purposes. Even the best roots lose considerably in weight in course of transport. A deduction of 10 per cent. for conveyance to Hong Kong, and of 20 per cent. for Europe is generally allowed on this account. In former years the crop was nearly all shipped in junks to Macao, but since the opening of Kiungchow the trade has been diverted to this port. The total annual production does not average more than 8,000 piculs, the bulk of which goes to Europe, where, besides finding favour as a spice, it is used for medicinal and tanning purposes.

Active Principle of the Root of *Apocynum Cannabinum*. O. Schmiedeberg. (*Journ. Chem. Soc.*, 1883, 1141.) This vegetable root contains two substances: one, *apocynin*, an amorphous, resinous substance, soluble in alcohol and in ether, almost insoluble in water; a very small quantity causes systolic pause in the heart of a frog. It does not seem to be a glucoside, although when boiled with moderately strong hydrochloric acid it produces a liquid which

reduces alkaline cupric oxide, and itself becomes inert as regards the heart, etc. The second substance is *apocynin*, which is a glucoside, and in its properties agrees essentially with nerein or digitalein, but, like apocynin, does not give any remarkable reaction with sulphuric acid and bromine.

Assay of the Root of *Atropa Belladonna*. W. R. Dunstan and F. Ransom. (Abstract of a paper read before the Pharmaceutical Society, February 6, 1884, and printed in the *Pharm. Journ.*, 3rd series, xiv. 623.) The authors criticise the various methods hitherto employed for this assay, and then recommend a process of their own, the details of which are as follows:—

Twenty grams of the dry and finely powdered root are exhausted by hot percolation with a mixture of equal parts by volume of chloroform and absolute alcohol; if an extraction apparatus is used about 60 c.c. of the mixture is required. The percolate is agitated with two successive 25 c.c. of distilled water, which are separated in the usual way. These are mixed and well agitated with chloroform to remove the last traces of mechanically adherent colouring matter. The chloroform is separated, the aqueous liquid rendered alkaline with ammonia, and agitated with two successive 25 c.c. of chloroform, which are separated, mixed and agitated with a small quantity of water (rendered faintly alkaline with ammonia) to remove adherent aqueous liquid. The chloroform is then evaporated over a water-bath until the weight of the atropine and hyoscyamine is constant, which usually occupies a little less than one hour.

The special features which distinguish this process are: (1) it is simple and accurate; (2) a high temperature is avoided; (3) the solvent employed extracts a minimum of non-alkaloidal constituents; (4) no precipitants are used; (5) the use of acids is avoided; (6) the alkaloids are not heated with alkalis.

The root of *Atropa Belladonna*, grown at Hitchin and carefully dried at 100° F., yielded 0.38 per cent. of total alkaloid (atropine and hyoscyamine) when estimated by this process. Other specimens estimated in the same way yielded 0.39 per cent. and 0.35 per cent. of total alkaloid.

Japanese Belladonna Root (*Scopolia Japonica*). J. F. Eykman. (*Nieuw. Tydschr. Pharm.*, May, 1884, 154, and June, 1884, 177.) The statement that this root yields a powerful mydriatic alkaloid, previously made by Dr. Langgaard, is confirmed by the author, who gives this body the name "*scopoleine*," and believes it to belong to the group of tropeines. The blue fluorescence observed by some chemists in aqueous extracts of the root is shown by him to be due

to a non-nitrogenous body, of the composition $C_{13}H_{10}O_6$, which he proposes to name "*scopoletin*," and which can be extracted from the root by means of chloroform. It crystallizes in colourless needles or prisms, which are soluble in hot alcohol and in boiling water, forming acid solutions which show an intense blue fluorescence. This body, however, does not pre-exist in the root, but in a decomposition product of "*scopolin*," a glucoside of the formula $C_{34}H_{30}O_{15} \cdot 2H_2O$, obtained by the author in white acicular crystals possessing narcotic but no mydriatic properties. He believes it not improbable that *Atropa Belladonna*, *Hyoscyamus niger*, and *Datura Stramonium* may also contain glucosides in addition to the alkaloids obtained from them.

Gulancha. (*Zeitschrift des oesterr. Apoth. Ver.*, 1884, 312.) This Indian drug consists of the roots and stems of *Tinospora cordifolia*, also known as *Menispermum cordifolium*, *Cocculus cordifolius*, and *C. convolvulaceus*. It is now re-introduced to the notice of the profession as a specific tonic, antiperiodic, and diuretic. A description of the drug will be found in the original article. The natives attribute particular efficacy to an extract known as "*palo*." In some parts of India this drug also enjoys a reputation as a remedy against the bites of poisonous insects and snakes.

Manaca, or Vegetable Mercury. M. Lenardson. (*Pharm. Journ.*, 3rd series, xv. 82.) This American drug is described as consisting of pieces of the stem and root of *Franciscosa uniflora*, still covered with bark. The two most important constituents appear to be an alkaloidal body, which is represented by the formula $C_{15}H_{23}N_4O_6$, and has been named "*manacine*," and a fluorescent substance. Manacine is described as a light yellow, very hygroscopic powder, having a faint bitter taste and possessing only weak basic properties; it melts at $115^\circ C.$, and has not yet been obtained in the crystalline form, though it dialyses readily; it is freely soluble in water, and in ethylic and methylic alcohol, but insoluble in ether, benzene, amyl alcohol, and chloroform. The solutions are very unstable, that in hydrochloric acid being the most permanent. In concentrated solution it gives with all metallic salts amorphous precipitates that are soluble in water. The alkaloid is poisonous in large doses, and is considered to be the active principle of the drug. The fluorescent compound appeared to be identical in every way with gelseminic acid, since it agreed exactly with it in all the principal reactions, except that there was no separation of sugar when treated with caustic alkali or hydrochloric acid; but the author considers this character to have been attributed to

gelseminic acid by Robbins and Wormley through an erroneous observation. Both the alkaloid and the fluorescent compound were found in the wood as well as the bark.

Jambu Assu. Dr. Lyons. (*Therap. Gaz.*, iv. 450.) This drug consists of a mixture of stems and roots of unascertained botanical origin, used in Brazil as a stimulant, febrifuge, and antiperiodic; also in affections of the uterus. The author has isolated from it a bitter alkaloid, a crystalline neutral body, a peculiar acid, an essential oil, and a soft resin, to the latter of which he is inclined to attribute the medicinal action of the drug.

The Bark of *Zanthoxylum Caribæum*. MM. Heckel and Schlagdenhauffen. (*Comptes Rendus*, April 21, 1884.) In this bark the authors have discovered a compound, $C_{13}H_{24}O$, and a poisonous nitrogenous base, the composition of which they have not determined. Nitric acid gives it a bright red colour. The nitric acid solution, evaporated to dryness on the water-bath, and treated with a drop of stannous chloride, does not turn violet like brucine.

Cortex Rhamni Purshianæ (*Cascara Sagrada*). J. Moeller. (*Pharm. Journ.*, 3rd series, xiv. 467.) Convex or quill-shaped pieces of bark, three finger-breadths or more in width, and something over 2 mm. in thickness, violet-brown and smooth on the exterior surface, and Morocco yellow and finely wrinkled on the inner surface. In the older, superficially grooved specimens, the thin, corky, brownish layer peels off in places from the ochre-yellow net-like base; in the younger, occasionally quill-shaped bark, the superior surface is broken up into irregular divisions, a finger-breadth apart, pointed at both ends, and about 1 mm. in width at the middle.

The bark breaks with a short fracture; the external surface is smooth; on the internal the greater part is thickly studded with very delicate brush-like fibres of at most 1 mm. in length. To the unaided eye the diagonal incision appears nearly homogeneous. Under the lens one sees dispersed on the outer part bright spots, in the bast radiant streaks, with irregularly disposed diagonal lines between them.

A description of the microscopical structure of this bark by the same author has been previously published and abstracted in the *Year-Book of Pharmacy*, 1883, 214.

Cascara sagrada differs very clearly from the "*cortex frangulæ*" which is officinal in the German, Norwegian, Swedish, Danish, and Russian pharmacopœias, in the thickness and fragility of the bark, the frangula bark being at most 1 mm. in thickness and of a tough fibrous nature. An excellent distinctive feature of the American

variety is the groups of stone cells found in the middle bark and sparingly in the bast. These were also found to be absent in other varieties of *Rhamnus* examined by the author. It is also noteworthy that there is a hardening of the radiations of the medulla between the groups of bast fibre, as in the case of the *Rhamnus tinctorius*, thus differing from most of the other *Rhamnaceæ*.

The source of the cascara sagrada (sacred bark) is the *Rhamnus Purshiana*, D.C. (*Rh. alnifolius*, Pursh., *Frangula Purshiana*, Cooper), a shrub or tree 7 m. in height, which is found on the Pacific slope of the United States. Its branches are covered with down. The leaves are elliptical in shape, 5 to 8 cm. in length and 3 to 8 cm. in width, having a leaf-stalk of 2 cm. in length, blunt at the base, pointed and dentated at the margins. When young the leaves are thickly covered with hair, but later become smooth, similar to the leaves of the *Frangula Purshiana*, Gray, indigenous to the southern states. The flowers are disposed in dense corymbs, are small and white, and develop into black triangular fruit the size of a pea, each containing three shining seeds.

Cascara sagrada seems to be identical with chittem or shittum bark, under which name Ed. A. Mayer learned, as early as 1850, that the bark was used by the Indians and trappers of California as a cathartic. More recently it has been very extensively employed in America, where it is regarded very highly as a remedy in constipation and dyspepsia.

Two preparations manufactured from the bark are almost exclusively employed: an alcoholic extract and an elixir, made with dilute alcohol and glycerin, and the oils of orange and cinnamon, etc. A formula for the preparation of these was submitted by George W. Kennedy to the American Pharmaceutical Association (reprinted in the *Druggists' Circular and Chemical Gazette*, August, 1881, and in the *Pharmaceutical Journal and Transactions*, September, 1881). Complaints are already made of the existence of false varieties in the market. In the March, 1882, number of the *Therapeutic Gazette*, it is stated that owing to the ignorance of the drug-gatherers a large quantity of worthless and inert bark of other varieties has been placed on the market.

Cascara Amarga. F. A. Thompson. (*Amer. Journ. Pharm.*, 1884, 330.) Cascara amarga, also known as Honduras bark, is obtained from a tree indigenous to Mexico. Specimens of this bark have been submitted to Dr. Vasey, of the Department of Agriculture at Washington, for examination, resulting in the opinion that it belonged to the genus *Picramnia* (from *picros*, bitter, and *thamnos*,

shrub), which numbers no less than twenty species. Dr. Vasey, having only two varieties in his possession, was unable to determine the exact variety. *Picramnia* is said by different botanists to belong to the natural order *Anacardiaceæ*.

The bark as seen in commerce is mostly deprived of its outer bark, which is from one to three millimeters thick, of a brownish grey colour, striated, and much divided by numerous longitudinal fissures. After being immersed in water, it assumes a greenish yellow tint. The inner bark is of a deep brown colour, three or four millimeters thick, hard and firm, of a bitter taste, and on examination of a transverse section numerous white spots are to be seen, which appear to be filled with a white, insoluble, inert substance.

Microscopical Examination.—The outer or cork bark is composed of twenty-five or thirty rows of regular thick-walled cells, filled with red colouring matter. The middle bark is composed of large irregular parenchyma cells, making up the greater share of the whole bark. Throughout this portion of the bark are numerous sclerenchyma cells, arranged in groups, and also one to three rows are always found close to the outer bark. These sclerenchyma cells make a prominent marking, as seen with the naked eye, in the cross-section. Also, at intervals, are one to three ranked series of sclerenchymatous fibres or bast-fibres, arranged tangentially, which turn brown after treatment with iodine. The inner bark does not differ very much from the middle, except that it is divided by several rows of medullary rays composed of regular cells.

The author's chemical examination of the bark has revealed the presence of an alkaloid which he proposes to name *picramnine*. It is a white, crystallizable, tasteless substance, having a low fusing-point, freely soluble in chloroform, less soluble in ether and benzene; insoluble in dilute acids and fixed alkalies; and when fused on platinum foil develops a strong fat-like odour, reminding one of the odour of the fats when fused. A small portion allowed to crystallize from hot alcohol deposited white acicular-shaped crystals.

Analysis of Samples of Natural and Renewed Succirubra Bark from the same Quills. J. Hodgkin. (*Pharm. Journ.*, 3rd series, xiv. 481.) A parcel in a recent consignment of Ceylon succirubra consisted of quills of natural and renewed bark in juxtaposition: these quills were about a foot long, the upper half being renewed bark (No. 3), whilst the lower portion was natural (No. 2). As in the same consignment there were parcels of bark entirely natural

(No. 1), as also bark entirely renewed (No. 4), an opportunity offered itself for testing whether the renewed and natural barks in direct contact with one another afforded intermediate results to those obtained from the unmixed barks. The quantity experimented upon in each case was identical, and the percentage of moisture contained in the various barks was noted, in order that the analyses might be brought to one level for greater ease in comparison. The results, therefore, have been calculated to Moens' standard hydration, viz., 13.5 per cent. The natural bark was carefully separated from the renewed bark by means of a pair of scissors. This was easily done, since the quills were thin and the bark somewhat flexible, owing to the high percentage of moisture contained therein.

No.	Description of Bark.	Percentage of moisture in the bark.	Quinine sulphate.	Cinchonidine sulphate.	Quiluba.	Cinchonidine.	Cinchona.	Quinidine.	Anorp ho Alk uol l	Total Alkaloid.
1	Natural Quills	13.33	1.352	0.948	1.014	0.711	0.661	Trace	1.222	3.608
2	Nat. portion from—Natural Renewed Quills	14.61	0.622	0.941	0.467	0.706	0.849	„	0.888	2.910
3	Renewed portion from the same Quills	15.96	1.474	2.076	1.050	1.557	0.817	0.051	0.810	4.235
4	Renewed Quills	18.84	2.311	2.379	1.744	1.784	0.717	Trace	0.871	6.116

It is worthy of note that the hydration differed considerably in the natural and renewed portion in the same quill. The renewed portions contained more water, probably owing to the soft, spongy renewal, which had evidently been accomplished by shaving and not stripping.

If it should be the case that the natural bark (No. 2) had suffered in the renewal, it will probably be found to be owing to some temporary injury to the tree, caused by the shaving process, as in McIvor's experiments no such deterioration was found. As regards No. 3, of course the reason for such a small increase in alkaloid is due to the fact that this bark consisted of those portions of the quill where the shaving ended, and consequently only a very thin layer of original bark had been removed.

Where a thicker layer, as in No. 4, had been removed, the increase in alkaloids was well marked. No. 3 was the only one that gave an appreciable quantity of quinidine, the others only giving a faint trace.

Assay of Cinchona Bark. A. Petit. (*American Drugg.*, 1884, 109.) Prollius has shown that the whole of the alkaloids of cin-

chona bark may be obtained in solution by treating, say 40 grams of the powdered bark with 800 grams of a mixture composed of—

Alcohol, 95 per cent.	. . . .	67 parts.
Ether, sp. gr., 0.724	. . . .	733 "
Water of Ammonia	. . . .	32 "

Comparative experiments by the author have shown that the bark must be in as fine powder as possible, and that if the mixture be shaken every five minutes, the exhaustion is as complete after one hour, as it will be after five or six hours if merely macerated. The next step is to pour off 600 grams of the liquid, corresponding to three-fourths of the alkaloids contained in the bark, that is, representing 30 grams of the latter. Now add to the ethereal liquid enough of a solution containing one-fourth of its weight of sulphuric acid, so that the aqueous layer which separates shall be just acid. In general, about 20 c.c. will be sufficient. This aqueous layer contains all the alkaloids of the ethereal liquid. The layer is separated by a suitable funnel (in fact, the ethereal liquid should be in a separating funnel when treated with the acid), and the ethereal liquid again agitated with 5 c.c. of the diluted acid and 15 c.c. of water. This portion is likewise separated and added to the former. Now heat the aqueous liquid on a water-bath in order to get rid of the dissolved ether, then dilute it with two volumes of water and precipitate with caustic soda in excess. On stirring with a glass rod, the alkaloids coalesce together in a mass. The same result may also be obtained by warming the liquid on the water-bath. Transfer the alkaloids to a tared capsule and dry them at a temperature of 100° C. (212° F.). If the liquid is not perfectly clear, it is passed through a tared filter, and the gain in weight of the latter, when dried at 100° C., added to the alkaloids in the capsule. We have now the weight of the total alkaloids contained in the 30 grams of bark, and from this we may calculate the quantity contained in one kilogramme.

The next step is to ascertain the proportion of alkaloids soluble in ether. Proceed as follows: Dissolve the total alkaloids in a slight excess of sulphuric acid. Add 25 c.c. of ether (sp. gr. 0.724) and 5 c.c. of water of ammonia, and shake. The alkaloids soluble in ether are thereby taken up. Decant the ether; shake again with 10 c.c. of ether, and decant again. Unite the ethereal solutions, let stand fifteen minutes, so that the alkaloids which are but little soluble in this menstruum may deposit; decant again, and shake the clear, decanted ethereal liquid with 10 c.c. of diluted

sulphuric acid (1 in 20). Separate the aqueous liquid; agitate the ethereal solution with 5 c.c., more of the dilute acid, and add the second aqueous layer to the first. Dilute the united liquids with water to 25 c.c., heat to boiling, and saturate with pure diluted water of ammonia (1 in 5). As soon as the reaction is faintly alkaline, the heating is interrupted. The sulphate of quinine will now separate in fine needle-shaped crystals. When completely cold collect it upon a tared filter, and wash it with a cold saturated solution of sulphate of quinine; finally dry it at 100° C. (212° F.), until the weight remains constant. We have now the weight of sulphate of quinine obtainable from 30 grams of bark, and therefore, by a simple calculation, that contained in one kilogramme.

In order to prove that the sulphate of quinine thus obtained is pure, the salt is dissolved with the aid of sulphuric acid, and examined by the polariscope. If the rotatory power does not approach sufficiently close to -238.3 with sodium light, at a temperature of 15° C., the salt must be purified by a renewed treatment with ether and ammonia and recrystallization. According to the author's experience, the polarimetric deviation is proportional to the quantity of salt dissolved; the amount of sulphuric acid does not influence this deviation, provided it is present in at least sufficient quantity to form bisulphate of quinine. In practice the author prefers a solution containing 1 gram of basic sulphate dried at 100 C°, dissolved in 2 c.c. of one-tenth per cent. sulphuric acid, and enough distilled water to make 20 c.c. Under these conditions the polariscope deviation is -100° for pure sulphate of quinine at 15° C. According to the author's experiments, it is necessary to add to the observed degree about one degree for every four degrees of temperature above 15° C. These different treatments by acid, and the separations of the ether, are very rapidly performed if the operator has had some previous practice in these manipulations. A few hours are sufficient to make a complete assay of cinchona by this process.

Globularia. E. Heckel and M. Schlagdenhauffen. (*Ann. Chim. Phys.* [3], xxviii. 67-81.) E. Heckel's previous results respecting the composition of globularia will be found in the *Year-Book of Pharmacy*, 1883, p. 216.

In the present paper the authors furnish additional information respecting the analyses of stalks and leaves of *Globularia alypum*, and *G. vulgaris*, and the properties of certain of the constituents. In the former plant, Walz, in 1857, found a new glucoside, *globularin*. The authors recognise the presence of some substances overlooked by Walz, and they find that the tannin of the plant is

no special modification. The substances separated and estimated by them are globularin, cinnamic acid, potassium and sodium cinnamates, tannin, mannite, glucose, chlorophyll, resins, colouring matters, and fixed salts. The presence of the volatile compound detected by Walz was confirmed, but it exists in quantity too small for examination, at least with the amount of material at the authors' disposal; they think it may be cinnamic aldehyde, and that it may be the cause of the peculiar excitement produced by the administration of the extract. The *globularetin* and *paraglobularetin* of Walz are merely products of decomposition.

Phoradendron Flavescens. J. Moeller. (*Pharm. Centralhalle*, 1883, No. 14; *Amer. Journ. Pharm.*, 1883, 421.) The author has examined the drug, consisting of dried stems, leaves, and flowers.

The stem fragments are of the thickness of a quill and about the length of a finger, varying in colour between gamboge yellow and blackish brown, wrinkled, and with opposite leaf scars. The cuticle is thick, on the youngest branches beset with short, conical, thickened hairs, frequently in pairs; the bark is relatively thick, contains groups of stone cells and lighter coloured bast bundles arranged in a circle, and is free from starch; the wood contains starch in the pith, in the medullary rays, and in the scattered wood parenchyma cells. The leaves are smooth, when full grown, oblong or roundish elliptic, about 6 cm. long, sometimes spatulate, short petiolate, leathery, with the margin entire, the upper surface finely wrinkled and without visible nervation, the lower surface distinctly three-nerved, and the nerves sparingly branched. The cuticle is thick; the epidermis consists of polygonal cells, and has on the lower surface numerous stomata; there is no distinct palisade layer, the mesophyll consisting of thin-walled, loosely united cells with a few intercellular spaces, and containing tannin, mostly also yellow resin, and in scattered cells near the fibro-vascular bundles, also crystalline groups of calcium oxalate.

The flowers are axillary, in whorled spikes, quite small, somewhat imbedded in the axis, three cleft, the pistillate ones in two or three whorls, with a hypogynous one-celled ovary and a two-lobed stigma; the staminate flowers longer and denser, with three stamens united to the base of the perianth.

Mountain Sage (Sierra Salvia). J. Moeller. (*Pharm. Centralhalle*, 1883, No. 17. From *Amer. Journ. Pharm.*) The author gives the following description of this bitter aromatic drug:—

The stems attain about the thickness of a quill, are somewhat angular, woody, and with leafy branches. The leaves are short,

petiolate, divided antler-like, the upper ones lanceolate or spatulate, sessile, scarcely 5mm. ($\frac{1}{4}$ inch) long and 1 mm. ($\frac{1}{16}$ inch) broad. The erect, nearly globular small flower-heads are on short pedicels in the axils of the leaves, either single or in small racemes. The outer involucreal scales resemble the leaves, the inner ones are broader, ovate, three-cleft, membranous, and long-ciliate. The receptacle is flat, long-villose, and bears a small number of yellow tubular florets.

The hairs are quite characteristic, T-shaped; the basal cell projects somewhat above the dense cuticle, and is surrounded by two thin-walled stipitate cells and a terminate cell, which is forked, thick-walled, and shows an internal cavity only at the fork. The hairs are coloured faintly yellow by aniline sulphate. The author doubts the identity of the plant with *Artemisia frigida*, Wild., which is indigenous to Siberia.

Constituents of Ericaceæ. R. Thal. (*Pharm. Zeit. für Russl.*, 1883, Nos. 14-18; *Amer. Journ. Pharm.*, 1883, p. 468.) The author prepared *ericolin* from 800 pounds of the herb of *Ledum palustre*, by boiling it in a still with water, precipitating with acetate and subacetate of lead, freeing the precipitate from lead, evaporating to an extract, and exhausting this with spirit of ether. *Ericolin*, $C_{26}H_{30}O_5$, is inodorous, brown-yellow, sticky, hygroscopic, strongly bitter, very soluble in alcohol and ether-alcohol, very sparingly soluble in ether, chloroform, and benzene, and gradually decomposed when in contact with water, the odour of ericinol being developed, sugar dissolved, and a brown powder separated, which aggregates into a blackish brown mass. This decomposition is rapidly effected by heating with dilute mineral acids and ericinol, $C_{30}H_{26}O$, by combining with water, is further converted into *hydroericinol*, $C_{10}H_{20}O_4$. The latter is a thick fluid, brown-yellow, of a peculiar strong odour, and a balsamic, not bitter taste; on keeping even in vacuo it becomes partly insoluble in ether.

Ericolin prepared from *Calluna vulgaris* differed somewhat from the preceding. By following the process given in outline above, and treating the ether-alcoholic extract with warm dilute sulphuric acid, the odour of ericinol was observed, and the presence of ericolin shown in *uva ursi* and twenty-nine other ericaceæ; namely, six species of *Erica*, ten of *Rhododendron*, three of *Vaccinium*, three of *Azalea*, in *Gaultheria Shallon*, *Pursh*, *Clethra arborea*, *Eriodictyon glutinosum*, *Epigæa repens*, and *Ledum latifolium*. The last two species and the rhododendrons gave the strongest odour of ericinol.

The lead precipitate mentioned above contains *leditannic acid*, $C_{15}H_{20}O_8$, which, in addition to the properties described by Willigk (1852), was found to have a distinctly acid reaction and acidulous astringent taste; it dissolves with difficulty in ether, more readily in acetic acid, and its aqueous solution precipitates cinchonine sulphate, dingy flesh-coloured; lead acetate, light yellow; tartar emetic, brown; copper acetate, brown-black. Gelatin causes a copious precipitate, and silver nitrate is reduced. By dilute mineral acids it is split up into water and *ledixanthin*, $C_{30}H_{34}O_{13}$; the latter is brown-red, sparingly soluble in water, and freely soluble in alcohol before drying.

The author prepared also *callutannic acid*, which resembles the above, but yields with gelatin only a turbidity. He instituted also comparative experiments with *pinipicrin*, and confirmed its close resemblance to ericolin, which had already been observed by Kawalier (1852), but could not prove the identity of the compounds.

Gouania Domingensis. (Abstracted from *Pharm. Centralhalle*, 1883, No. 14, by J. M. Maisch.) The cylindrical stems are 8 to 16 mm. ($\frac{1}{4}$ to $\frac{3}{4}$ inch) thick; the dingy grey-brown bark is 1 mm. ($\frac{1}{16}$ inch) thick, longitudinally wrinkled, and with difficulty separated from the wood. The very thin cork consists of somewhat flattened cells, with mostly the inner wall thickened, and containing a red-brown mass. The middle bark contains chlorophyll, and in many cells single monoclinic crystals of calcium oxalate, the primary bast bundles in small groups, the fibres broad, usually roundish and with distinct layers, occasionally groups of small, lemon-yellow stone cells inclosing crystals. The inner bark consists of extended bast bundles divided by the delicately-celled medullary rays, and surrounded by rows of crystal cells. The bast fibres are long, thin, and characterized by the sharply-defined primary membrane. The sieve tubes in the inner layer are prominent from their large apertures, and in the older layers appear shrunken in branching cords forming the so-called horn bast. The joints of the sieve tubes are about .4 mm. long, and have the transverse membrane horizontal, coarsely porous, and mostly covered with thick callus. The bark is free from starch.

Zinc chloride, with iodine, imparts a violet colour to the entire primary bast fibres, and with considerable swelling to the secondary layers of the secondary bast fibres and to the sieve-tube walls. All other cell membranes are coloured yellow, and the contents of tangential groups of parenchyma cells in the soft bast brown.

These contents are insoluble in cold water and potash solution, almost completely soluble in boiling water, and are coloured black by ferric salts. Other parts of the bark are free from tannin. The bast parenchyma is thin walled; the cells of the medullary rays become sclerotic only in old stems.

The wood is in circular layers, the early ducts of each year often larger, the several layers varying in thickness, occasionally rather compact, frequently very porous, the wood cells not numerous. The ducts are usually imbedded in parenchyma, appear transversely round or roundish, are sometimes 3 mm. in diameter, and upon the walls dotted. The parenchyma contains rows of crystal cells; the pith has the cell walls somewhat thickened, and contains scattered crystals.

The bark has a bitter taste. The yellow colouring matter is contained in the membrane, and yields with hot water a tasteless solution, which does not react with ferric chloride or alkalies.

Microscopic Examination of *Grindelia Robusta*. J. Moeller. (*Pharm. Centralhalle*, 1883, No. 19; *Amer. Journ. Pharm.*, 1883, 566.) The young parts of the cylindrical stem are covered with white, soft hairs. The leaves are thickish, sessile, more or less amplexicaul, spatulate-lanceolate dentate, and pellucid-punctate. The secondary nerves are sparingly branched, and at some distance from the margin form slings. The flower heads terminate the branches. The involucre consists of several rows of narrow spatulate, smooth, sharp-edged scales, which are curved back at the apex, and are covered with a brown glutinous mass. The receptacle is somewhat convex; the florets are tubular, yellow, and hermaphrodite.

The resinous covering of the leaves is secreted by the glandular hairs, which are always simple, frequently with a double row of cells, and occasionally parenchymatic; the terminal gland is four- to several-celled. Similar but pointed hairs are likewise observed. The mesophyll is a loose tissue with indistinct palisade layer, supported by thicker walled cell rows, which extend transversely through the leaf. The thin-walled cells contain much tannin.

A previous notice will be found in the *Year-Book of Pharmacy*, 1878, pp. 197 and 371.

Munjeet Stems (*Rubia Cordifolia*) in Chiretta. W. Elborne. (*Pharm. Journ.*, 3rd series, xiv. 538.) Attention has previously been called to this adulteration by E. A. Webb (*Pharm. Journ.*, 3rd series, i. 867). Recently it has been again observed by H. Woolley, and brought by him under the notice of the author, who

now supplies the following distinguishing characters of the two plants:—

Rubia cordifolia.

Stem.—Long, trailing, outer bark mainly absent; stems on that account round, and of a dull red colour. When the outer bark remains attached (at apex), quadrangular, covered with minutest prickles at the angles. Fracture, red. Pith, absent.

Leaves.—Lamina, about one inch in length, obcordolanceolate, five ribbed, ribs armed with prickles; supported on long petioles, arranged in whorls of four at the nodes, the latter very conspicuous.

Ophelia chirietta.

Stem.—Erect, smooth. Fracture, white, with shrunken pith.

Leaves.—Sessile.

Examined microscopically, the internal structure of each is so marked that a glance will suffice to distinguish them. In the section of *R. cordifolia* it will, however, be noticed that the woody tissue is more abundant, permeated with very large vessels, and coloured throughout with red matter.

Microscopic Characters of Tonga. J. Moeller. (*Pharm. Journ.* 3rd series, xiv. 884, from *Therapeutic Gazette*.) Coarsely cut, partially pulverized stalks of two different and easily distinguishable plants. The mixture has a strong odour reminding one of fenugreek.

The greater bulk of this drug consists of irregularly-shaped fragments of the stalk of a plant, seldom exceeding 2 cm. in length, sometimes, perhaps, as thick as a man's finger, very light and porous on the cut or broken surfaces or barkless portions, covered with a cork-coloured or dark brown bark; or of round stalks of the thickness of a quill and ribbed lengthwise; or of flat pieces of bark which, to judge from their size and form, evidently belong to the said fragments. The stem is composed of closely arranged bundles of dense fibres and covered by a comparatively thin bark traversed by hard, whitish streaks. This part of the drug has a specific odour and a delicate taste, slightly reminding one of vanilla.

The peridermis consists of five to eight rows of flat cells, some of which are thin-walled, the majority, however, being thickened almost to obliteration. The cells of the bark parenchyma are large and thin-walled, scarcely 0.5 mm. broad, and covering but a small area. In older plants they reach 2 millimetres in width and have numerous irregularly disposed fibres, which are each of them dis-

tinguished by a well-developed bast bundle, presenting a kidney-formed section, in the concavity of which, which always faces inwards, are a small number of narrow tracheæ. A few isolated, spindle-shaped, strongly solidified bast fibres, 0·025 mm. in diameter, are to be found irregularly distributed amongst the parenchyma. The vascular bundles of the plant are distinct from the peripheric fibres, owing to the different location of the bast and greater development of the wood, in which occurs a single vessel, or more rarely a pair of vessels, distinguished by a broad lumen (0·15 mm.). Raphidæ and glandular ducts are found within the principal parts of the stem, and especially in the bark parenchyma.

This ingredient of the tonga is derived, as Holmes (see *Year-Book of Pharmacy*, 1880, p. 185) had first suspected, and as has since been repeatedly proved, from a species of Aroid found in the Fiji and New Hebrides Islands, and known under the name of *Raphidophora vitiensis*, Schott. It is a variety of *Raphidophora pertusa*, Schott, *Monstera pinnatifida*, C. Koch, found on the coast of Coromandel, in Ceylon, Java, Timor, and in those parts of Australia which lie within the tropics.

The other and less bulky component part of this drug consists of small particles of bark, seldom as large as a finger nail, and not more than 1 millimetre in thickness. The outer side of this bark is scaly, and in colour it varies from an ochre yellow to a tile brown hue; the inner side is dark brown and wrinkled. It is a fine-grained, brittle bark, showing a chocolate-coloured section sprinkled with bright spots or points, and is wholly insipid and odourless.

The corky layer, which is no thicker than paper, is composed of cubic cells, with walls almost always very thin on the inner side, but occasionally thickened. This coating lies immediately contiguous to the inner bark,¹ which is traversed by one- to three-seried medullary rays, the alternating spaces between which seldom exceed 0·5 mm. The bast rays consist of alternately arranged layers of parenchyma and sieve tubes; the membranes of both are dense, present an almost gelatine-like appearance, and are wholly devoid of bast fibres. On the other hand, groups of parenchyma often become sclerotic, which change is frequently accompanied by a moderate increase of their elements, the form of which, however, is not materially changed. The density of the walls of these, although formed of the most delicate layers, increases to an almost complete solidification, but they are still perforated by numerous minute pores, visible only under a very powerful microscope. Where the stone cells of neighbouring groups come into contact

with each other, which, by the way, but seldom occurs, the medullary ray passing through them becomes sclerotic. Nearly all the medullary ray cells, as also many of those of the bast parenchyma, are heavily charged with crystal sand or raphides. The sieve-tubes are somewhat more open; their transverse plates are occasionally to be seen in the section of the bark itself.

The author says that this ingredient is the bark of the *Premna taitensis*, D.C. (*Pharm. Centralkalle*, 1881, 548), a species of the Verbenaceæ found on the Society Islands, and called "aro" by the natives, and in this he is corroborated by its anatomical structure.

Folia Chekan. J. Moeller. (*Therapeutic Gazette*.) The dried leaves with a few fragments of leaf-stalks.

The leaves are stiff, although not very brittle; the majority, therefore, when received in good condition are very delicately wrinkled, of a bright green colour, with a yellowish streak, short stem, somewhat curled at the rim, and bald on each side. On the superior surface, which to the unassisted eye appears finely granulated, the central nerve only is visible in the majority of leaves; it is only in the larger leaves that secondary nerves may be traced to the circumference. On the lower surface the nerves on all leaves are prominent. The leaves are dotted with transparent points, though in the smaller leaves these points are visible only under the glass.

The leaves are elliptical to oval in shape, pointed at the top, and narrowed at the base; they vary in size (from 1 to 4 cm. in length), although the proportion between the length and breadth is constant (1 : 2.5). The leaves are quite odourless; on being rubbed between the fingers they, however, emit an agreeable aromatic odour. Their taste is at first purely aromatic, but is afterwards strongly bitter.

Microscopic Characteristics.—The cuticle is particularly developed on the superior surface of the leaf; a double row of palisade cells constitutes scarcely a third of the thickness of the leaf; the mesophyll consists of irregularly branched cells in an ordinary loosely arranged parenchyma. Large crystal cells are occasionally found among the palisade cells, but seldom or never in the mesophyll. Globular oil cells (0.07 to 0.15 mm. in diameter), with yellowish contents, are disposed under the cuticle of both the upper and lower surfaces.

The plant (*Myrtus Chekan*) from which the chekan leaves are gathered, is an evergreen shrub about 2 m. high, found in the central province of Chili. It differs from *Myrtus communis*, L., chiefly in the fact that its leaves are shorter and broader. Its

flowers, also, are composed of but four leaves, are hairy like the stem-leaves, and are rounder than those of the latter. The leaves somewhat resemble smaller buchu leaves, especially those of *Barosma crenulata*, Hook., but the edges of the latter are indentated, and so are readily recognised.

The virtues of chekan leaves reside in the tannin and ethereal oil which they contain. Hutchinson has vainly sought to discover an alkaloid in them (*Pharm. Journ.*, 1879, p. 653). He discovered tannin which would turn blue in the presence of iron salts, and an ethereal oil, volatile at the ordinary temperature, soluble in chloroform, ether, ethylic and amyl alcohol, insoluble in water, and burning with a bright, white flame.

This plant has long been used under the name of chekan, chequen, or cheken, in Chili, where it is held to be powerful, aromatic, and astringent. The juice of its leaves and young wood, diluted with water, has been especially recommended as a collyrium. Don reports remarkable cures of dysentery effected by the liquor in which its bark has been steeped.

Dr. Dessauer, of Valparaiso, has recently been making extensive clinical experiments with chekan leaves. He used an infusion (1 part leaves with 10 parts boiling water), or an extract (produced according to the method prescribed in the United States Pharmacopœia for extracts of cinchona bark), or a syrup (1 part leaves and 2 parts syrup), or finally by inhalation. The results which he has obtained in bronchitis, catarrh of the bladder, and other affections of the mucous membranes, have induced him to ascribe to these leaves tonic, expectorant, diuretic, and antiseptic qualities. Linarix attributes these same properties to the oil of common myrtle.

Microscopic Structure of the Leaves of *Eriodictyon Californicum*.
J. Moeller. (*Pharm. Centralhalle*, 1883, No. 19; *Amer. Journ. Pharm.*, 1883, 568.) The leaves are leathery, lanceolate, about four inches (10 cm.) long, about half an inch (1 to 1.5 cm.) broad, short petiolate, repandentate, green and glossy above, dark reticulate and grey beneath. The upper epidermis is large-celled and covered with a moderately tough and delicately wavy-furrowed cuticle, the grooves containing many-celled glands upon two or three-celled stipes. The secretion of the glands is yellowish green, resinous, soluble in alkalies, contains numerous needle-shaped crystals, and covers the upper surface sometimes to the thickness of .02 mm. Under the thick palisade layer is the mesophyll, composed of stellate cells, which, between the veins, are in contact with the

small-celled epidermis of the lower surface; many of these epidermal cells are elongated to thin, grey, felt-like hairs. The primary nerves contain on the lower side a thick layer of collenchyma, and a palisade layer is formed in the angles of the secondary nerves. The epidermis alongside of the nerves is smooth, and contains only few glandular hairs like those of the upper surface. The parenchyma is free from tannin; many cells contain groups of oxalate crystals. Strong alcohol takes up 30 to 40 per cent. of resin, having a tolu-like odour. W. H. McLaughlin obtained two resins, one of which was soluble in ether, bitter principle, gum, tannin, fat, volatile oil, sugar, and another crystalline principle.

Previous notices of this plant will be found in the *Year-Book of Pharmacy*, 1881, 115; 1880, 215, 216.

Microscopic Structure of the Leaves of *Duboisia Myoporoides*. J. Moeller. (*Pharm. Centralhalle*, 1883, No. 20; *Amer. Journ. Pharm.*, 1883, 569.) The leaves resemble willow leaves in outline, attain a length of 12 cm. ($4\frac{1}{2}$ inches), and width of 3 cm. ($1\frac{1}{2}$ inch), are shortly petiolate, entire, the margin slightly revolute, and have a prominent midrib, the secondary veins diverging at nearly right angles and forming slings near the margin. A parenchymatic excrescence along the upper side, upon the midrib, is characteristic of the leaves, and may be observed with the naked eye. The upper epidermis has few stomata and somewhat smaller, flatter, and thicker-walled cells than the lower epidermis, which contains numerous stomata and scattered clavate hairs. On placing a microscopic section in warm potash solution, a large number of acicular crystals make their appearance upon the lower, but not upon the upper side of the leaf. The crystals are soluble in water and alcohol, and make their appearance after the leaf has been kept for several hours in water, but not after it has been extracted with alcohol.

Previous notices of the plant will be found in the *Year-Book of Pharmacy*, 1878, 264, 266.

The Chemical and Pharmacological Behaviour of *Folia Uvae Ursi* and Arbutin in the Animal Body. L. Lewin. (*Therapeutic Gazette*, September 15, 1883.) There are two possible methods in which the leaves of *uvæ ursi* may act; namely, through the arbutin or the tannic acid which they contain. The author's experiments have proved that when arbutin is introduced into the system, either hypodermically or by the mouth, it is decomposed. There appears in the urine a substance which, on a brief exposure to air, changes to an olive-green or brownish colour. This substance

is hydrochinon, as may be demonstrated to a certainty. These changes are also observed in the urine of man after the administration of *uvæ ursi* leaves. At first the urine is of a bluish green colour, but after standing from twelve to twenty-four hours, it becomes of a somewhat darker green; then olive-green, and later brownish green. It also happens that that which, when voided, is of a greenish brown, afterwards becomes of such a dark green as to lose its transparency. With the onset of the dark discoloration the acid reaction of the urine diminishes, and it finally becomes alkaline.

The chemical changes are as follows: the arbutin is converted into hydrochinon, and the latter is in turn converted into sulphate of hydrochinon. On standing exposed to the atmosphere, the hydrochinon sulphate may, through the gradually growing alkalinity of the urine, be split up, and the free hydrochinon further oxidized into products not definitely known. When the urine has already become alkaline in the bladder, the process above described takes place in the bladder, and the urine is voided of an olive-green colour. But the whole quantity of arbutin taken into the system is not decomposed into hydrochinon and sugar. The author has shown that a portion of this is voided unchanged in the urine.

Arbutin is not poisonous. It does not, through splitting up, set free in the body a sufficient quantity of hydrochinon to have a poisonous action.

As touching the action of *uvæ ursi* leaves and their different medicinal preparations, the author has demonstrated by experiments on the human being and lower animals, that the chemical changes are identical. In these experiments are also usually observed a progressive dark discoloration of the voided urine, proportioned to the amount of hydrochinon which is traceable. This is, however, not always the case, as has been taught in practice. It is to a secondary degree dependent upon the size of the dose administered. It is to a greater degree influenced by the condition of the urine. When *uvæ ursi* leaves are administered in vesical catarrh, attended by an ammoniacal condition of the urine, the latter is discoloured to a greater or lesser degree. The rotation of the polarized ray to the left shows also the presence of unchanged arbutin in such urine.

With these results as a basis, it is not difficult to establish the fact that the substance to which *uvæ ursi* leaves owe their reputation for specific action in vesical catarrh is hydrochinon. An auxiliary, although as compared with hydrochinon an insignificantly

small action, is due to tannin, which is contained in the decoction of *uvæ ursi* leaves, and is voided in a very small amount in the urine.

Hydrochinon possesses antizymotic and antiseptic properties in even a one per cent. solution. The author found that urine which had been voided after the administration of *uvæ ursi* leaves remained fresh, even after standing in the open air for two weeks, while that subsequently voided rapidly decomposed.

Hydrochinon possesses, particularly when it has become dark in solution, an irritating property. This irritation is, however, directly beneficial in catarrhal affections of the mucous membranes, which become turgid thereby, and have set up in them reparative action.

It is, therefore, to the antiseptic and irritating property of hydrochinon that the therapeutic action of *uvæ ursi* leaves is due.

It follows from this that much larger doses of *uvæ ursi* should be given than have heretofore been customary, inasmuch as even if the decomposition of one gram of arbutin into hydrochinon and sugar were complete, which is never by any means the case, the amount of hydrochinon which would thus be generated would be too small to secure the most beneficial local action on the bladder. In addition to this is the fact that the amount of arbutin contained in *uvæ ursi* leaves is very small. It is recommended, therefore, that when *uvæ ursi* leaves are administered, a decoction of from 30 to 80 grams in 180 grams of menstruum should be given. The objection which the large amount of tannin might interpose to the administration of such a decoction can be overcome by agitating it with charcoal:—

℞ Decoct. fol. *uvæ ursi* 30-80 : 180 grams.
 Agita c. carbone vegetabil., q.s. ad remov. acid. tannic.
 Filtra. S.

For this purpose the author would regard the substitution of arbutin for the decoction as an improvement, should arbutin in the future take the place of the leaves themselves in medicine. Arbutin may be ordered in the form of powder or in solution; for instance:—

℞ Arbutini 1.0 gram.
 Sacchari 0.5 „
 M. Ft. pulv.
 Or,
 ℞ Arbutini 5-10.0 gram.
 Aquæ dest. 100.0 „
 M.

It may also be given hypodermically.

Clinical experiments have in the meantime demonstrated the fact that arbutin is a valuable therapeutic agent.

Nettle Fibre. J. Moeller. (*Pharm. Journ.*, 3rd series, xiv. 786, from *Deutsche Allgem. Polyt. Zeitung*.) The author gives a report of experiments on the histological characters of the fibre of the common stinging nettle, *Urtica dioica*, and its applicability to technological purposes.

The primary bast-bundles of the stem do not form a connected ring, and its fibres are mostly separated by intermediate parenchyma. The cortical parenchyma is not sclerenchymatous. At the base of the stem the fibres are mostly about 0.12 mm. in diameter; higher up they are thinner; but even at the summit they have a diameter of 0.04 mm. The thinnest fibres of the nettle are therefore as thick as the thickest of hemp. In consequence of their isolation they are seldom polygonal. At the commencement of the time of flowering, the fibres in the upper portion of the stem only are completely thickened; those in the lower part have still large cavities. There are no pore canals. Fibres were measured 22 mm. in length; they are very irregular in form. They consist of nearly pure cellulose; their behaviour with cuoxam is characteristic. They swell with extraordinary rapidity from without inwards; a sharply differentiated internal layer resists the action for some minutes; but this is also at length dissolved; and in addition to a small quantity of contents of the fibres, a delicate network remains, consisting of the primary membranes of the parenchyma cells which surrounded the fibres.

Fibres baked or treated with acids or alcohol show two peculiarities. They are very irregularly isolated, being either united into bands or disintegrated into separate fibres; there are no thin bundles like those of combed flax or hemp. This peculiarity depends on the structure of the primary and on the want of secondary bast-fibre bundles. The second peculiarity is their complete and nearly regular investment with parenchyma, in consequence of which they are rough and dull; resulting from the incomplete differentiation of the wall of the fibres and of that of the parenchyma-cells.

Both these peculiarities are very disadvantageous to the employment of the nettle-fibre as a technical product. The chemical means employed to separate the fibres completely from the surrounding parenchyma would affect injuriously the fineness of the fibre.

Attempts have been made to naturalize in Germany the North American *Laportea pustulata*; but similar disadvantages attend the

structure of the fibre. In August the bast-fibres in the upper third of the stem are not yet developed; in the lower portion they are but imperfectly thickened. The cortex, bast, and fibres, resemble those of *Urtica dioica*; but the fibres are considerably larger at the base of the stem, usually 0.5 mm. in diameter, and more than 80 mm. long; in the middle part of the stem they have still a diameter of 0.1 mm. They consist of pure cellulose; they dissolve rapidly and completely in cuoxam, leaving behind a parenchymatous network and the protoplasmic contents of the fibres.

The Occurrence of Sugar in Tobacco. Prof. Attfield. (*Pharm. Journ.*, 3rd series, xiv. 541.) The author deals with the question whether or not sugar is a normal constituent of tobacco, and publishes a number of analyses showing that this substance does occur in it in quantities varying from mere traces up to 10 per cent., the average proportion in eight samples being 7.38 per cent. Besides this, an average quantity of 3 per cent. of substances yielding alcohol by fermentation is precipitated from tobacco infusions by such reagents as basic acetate of lead and lime water. The saccharoid matter not thus separated is termed by the author *tobacco sugar*; while this, together with the fermentable matter precipitated by the reagents named, is termed by him *total saccharoid matter*. The latter was found to vary between 8.2 and 12.8 per cent., the average proportion found being 10.39. No added sugar was found in any of the samples.

The sugar in tobacco appears to possess little if any action on polarized light. Such a fact would be of considerable importance in any examination of tobacco infusion for added sugar,—sucrose, glucose, lactose, etc.—which all exert well-marked dextro-rotatory or lævo-rotatory power on polarized light. The commercial samples of tobacco examined by the author, with scarcely an exception, yielded infusions which, even when colourless, did not perceptibly affect a polarized ray.

A Hitherto Unknown Constituent of Tobacco. T. J. Savery. (*Chemical News*, xlix. 123.) Whilst examining some tobacco for sugar, a substance was noticed in the aqueous solution which reduced Fehling's solution. This body was almost completely removed by clarification with subacetate of lead, and the resulting liquid was free from sugar. The author succeeded in isolating this reducing substance by precipitating with subacetate of lead, decomposition with sulphuretted hydrogen, etc. The substance gave a green coloration with ferric chloride, changing to red on the addition of potash. With ferrous sulphate alone no change was

produced, but when this reagent was added with ammonia, a dark brown colour appeared. A purer product from unmanufactured tobacco gave the same reactions, and developed a red colour with strong sulphuric acid, changing to a claret on the addition of a trace of nitric acid. A green colour was produced with either potash or ammonia. The substance precipitated hydrochlorides of quinine and cinchonine. The author concludes that the body is closely allied to caffetannic acid, and names it tabaco-tannic acid. No analyses are given.

In a subsequent note (*Chemical News*, xlix. 147) the author adds that the acid he found in tobacco is caffetannic acid, from which, by boiling with dilute hydrochloric acid, he obtained another acid, which he called tabaco-tannic acid. The latter body does not give a green coloration with ammonia, but a fine red-violet, a change which is due to oxidation. Its other reactions are equally distinct.

Geum Album. Dr. W. A. Spurgeon. (*Virg. Med. Monthly*.) The author regards this plant as a valuable anti-emetic, relieving gastric irritation and headache. He uses it in the form of a tincture, made with 8 troy ounces of the plant to the pint; the dose is a teaspoonful or more.

Boldoa Fragrans. P. Chapoteaut. (*Comptes Rendus*, April 28, 1884.) This plant contains a feebly alkaline principle, *boldine*, and a glucoside, $C_{39}H_{52}O_8$. If heated with dilute hydrochloric acid, it is split up into glucose, methyl chloride, and a syrupy compound soluble in alcohol and benzene, but insoluble in water.

Convallaria Majalis. W. S. Gottheil. (*Therapeutic Gazette*, January, 1884.) The author furnishes a detailed account of his use of *convallaria majalis* in fifteen cases, comprising organic heart disease, cardiac failure in acute rheumatism, hemorrhages or phthisis, and one case of Bright's disease. The results would seem to justify a thorough trial at the hands of the profession of this proposed substitute for digitalis. It possesses the very important negative property of producing no cumulative effect, a desideratum which has been long felt by the profession.

Coptis Trifolia. J. J. Schultz. (*Amer. Journ. Pharm.*, May, 1884.) The experiments described by the author show that *Coptis trifolia* yields to alcohol, slightly acidulated with acetic acid, 10 per cent. of its weight of extractive matter. Further, that it contains two alkaloids, as previously shown by the investigations of E. Z. Gross (*Amer. Pharm. Journ.*, 1873). That the berberine of *Coptis trifolia* is only partially separated by the processes usually employed for the determination of berberine. That it contains of

berberine an amount equivalent to 0·8 per cent. of sulphate of berberine, or 57 grains of sulphate of berberine to the avoirdupois pound. That the amount of the second alkaloid is very small, 0·012 per cent., or only 0·855 grain to the avoirdupois pound, having been obtained.

Viola Tricolor, var. Arvensis. K. Mandelin. (*Pharm. Zeit. für Russland*, 1883, 329-334; *Amer. Journ. Pharm.*, 1883, 470.) The author found in this plant a new colouring matter, *violaquercitrin*. The plant is exhausted with warm alcohol, the alcohol distilled off, and the residue treated with warm distilled water. On agitating this dark brown solution with benzene, for the purpose of obtaining the salicylic acid (see *Year-Book of Pharmacy*, 1882, 26), a yellow crystalline mass is precipitated. After washing, the crystals are easily soluble in alkalies with a deep yellow colour, and reprecipitated by acid. They are soluble in hot water, and crystallize again on cooling. Its composition is $C_{49}H_{49}O_{24}$. On being boiled with dilute mineral acids, it is split into quercetin, $C_{24}H_{16}O_{11}$, and a fermentable sugar, $C_6H_{12}O_6$. The acid filtrate contains a third product of decomposition, which may be obtained by agitation with chloroform, and is characterized by its beautiful fluorescence when in alkaline solution.

Luffa Ægyptiaca. R. J. Weber. (*Amer. Journ. Pharm.*, January, 1884.)

Description.—*Luffa Ægyptiaca*, nat. ord. *Cucurbitaceæ*, is indigenous to Egypt and Arabia, and is a large climbing vine, with a thin, but very tough, light green succulent stem, attaining a length of from ten to thirty feet. The leaves are alternate and palmately lobed, of a light green colour, and almost destitute of taste. The flowers are monœcious; petals five, united below into a bell-shaped corolla; anthers cohering in a mass; ovary two-celled, style slender, stigmas three. The fruit is elliptical ovate, fleshy and indehiscent, with a green epidermis, longitudinally marked with black lines, varying from ten to fifteen in number; under each of these lines is found a tough woody fibre. The fruit attains a length of from six to twenty-five inches. When the epidermis is removed it presents a layer of interwoven woody fibres, which may be used like a sponge, being hard and rough when dry, and soft when soaked in warm or cold water; they absorb the latter with the same facility as the ordinary sponge, and have the advantage over the sponge not to wear out by ordinary use for a number of years; hence the name of "vegetable sponge," or "wash rag," and its use as a flesh glove. The seeds are numerous, and are almost flat, broadly ovate, three-

eighths of an inch long. The testa is of a blackish brown colour and rough, cotyledons almost flat, of a yellowish brown colour and oily.

Analysis.—An infusion of the epidermis of the fruit (1 to 10) was made and tested for tannin, with tincture of chloride of iron, with sulphate of iron, and Russian isinglass, whereby a trace of tannin was shown. One hundred grains of the epidermis, thoroughly dried, yielded fifty-four per cent. of residue; on being incinerated at a low heat, the epidermis yielded twelve per cent. of a dark grey ash, one half of which was soluble in water; the ash consisted of silica, carbonates and sulphates of potassium and calcium. The fibrous portion, after being incinerated, yielded sixteen per cent. of ash, partly soluble in water.

The fruit contains a large amount of mucilaginous substance, which yields a white precipitate with solution of subacetate of lead.

An infusion of the fibrous portion, when evaporated to a syrupy consistence, became gelatinous on cooling. The gelatinous mass had all the properties of bassorin, and was free from starch. One troy ounce of the epidermis was powdered, and successively exhausted with benzene, alcohol, and water. The benzene solution yielded a small quantity of yellow colouring matter; the alcoholic tincture left chlorophyll and a little extractive; and the infusion gave twenty per cent. of slightly bitter extract.

One troy ounce of the powdered seeds was treated with boiling benzene; the green solution, on being evaporated, yielded two and a half per cent. of a brown, fatty oil, and twelve per cent. of a green mass. The latter, on being treated with very dilute hydrochloric acid, and evaporating the liquid, yielded a minute amount of crystals. Similar crystals were also obtained from the green alcoholic extract of the seeds previously exhausted with benzene. Water afterwards took up nothing of note.

Mode of Preparing the Fibrous Portion.—The fruit is cut longitudinally on one side, stripped of the epidermis, the seeds are then removed, and the network of fibres is washed thoroughly, to get rid of the mucilaginous substance, and dried. It is then ready for use. This fibrous portion is the only part of the plant that has ever been in use.

Hamamelis Virginica. (*American Druggist*, January, 1884.) The so-called witch hazel derives its name from the similarity of its leaves to those of the English hazel (*Corylus Avellana*, L.). The latter has been used from time immemorial as the attribute or divining rod of witches, and in the earlier days of the American

colonies "witch hazel" was made to do duty in place of the English.

The witch hazel (*Hamamelis virginica*, L.), which is also called, in some sections, "winter bloom," "snapping hazel nut," "spotted alder," etc., occurs in nearly all parts of the United States, chiefly in damp woods and thickets, along the moist banks of rivers east of the Mississippi, from the Mexican Gulf to Canada, but according to Pursh, also on hills and in stony places. Usually it is a bush or tall shrub, but sometimes attains a height of 20 feet. Like many other eastern American trees and bushes, it blossoms late in the autumn, from September to November, when the leaves are falling, and contributes its share to the many-coloured hues of the forest in the fall of the year.

The shrub usually consists of several crooked branching trunks arising from the same root, some 4 to 6 inches in diameter, 5 to 12 (sometimes 20) feet in height, and covered with a smooth, brown bark, the older bark becoming brownish grey and fissured, and the inner portion being whitish and smooth.

The fruit is a light brown, nut-like, roundish oval capsule or pod, two-celled, which incloses the seeds, but soon bursts elastically into two pieces. It ripens in the summer of the succeeding year.

The two seeds are shining black, with a white hilum; they are white, oleaginous, and starchy within, and are eatable, like hazel nuts. The seed of trees grown abroad germinates but rarely; the plant is there usually propagated by cuttings, which strike root very slowly.

There is only one other distinct species of *Hamamelis*; namely, *Hamamelis japonica*, and this differs only by slight characters, namely, by its having more leaf nerves, broader and revolute, brown calyx lobes, and a shorter fruiting calyx.

Medical Uses.—Both the bark and the leaves are used medicinally. The United States Pharmacopœia (1880) recognises only the leaves, though it would appear that the bark is much more extensively used. Both have a certain degree of fragrance, particularly when fresh, and, when chewed, are at first somewhat bitter, quite astringent, and leave a pungent, sweetish and persistent after-taste. Water as well as alcohol extracts their virtues. They appear to contain, according to Dr. A. Lea, besides the usual plant constituents, a peculiar bitter principle; this author first drew attention to the large amount of tannin they contain.

Witch hazel is reputed to be tonic, astringent, and sedative. A decoction of the bark (1 oz. to 1 pint) has been found useful in hemorrhages, as well as in diarrhœa, dysentery and excessive

mucons discharges. Its supposed beneficial effect in incipient phthisis, where it has been thought to unite anodyne influences with its others, is probably unsupported by facts.

The bark is reported to have long been known to the Indians—which is not at all surprising—as an excellent remedy in swellings and tumours of a painful character, as well as in external inflammations, applied in form of a poultice.

The decoction may also be used advantageously as a wash or injection for sore mouths, painful tumours, and is probably useful in any cases where a local astringent is indicated, as in leucorrhœa, gleet, conjunctivitis, etc. Professor Stillé states that he has known the decoction or infusion to be used, as a lotion, with apparent benefit, in *crusta lactea*.

An ointment made with lard and a decoction of white-oak bark, apple-tree bark, and witch hazel bark, has been found a valuable application to piles. The same is very generally reported of the so-called white extract of witch hazel, which is said to be made by distilling the fresh bark with a very dilute (6 per cent.) alcohol. This preparation is a popular external remedy in sprains and bruises, and is besides vaunted as a cure for almost every disease flesh is heir to.

Dr. King states that he used a decoction of equal parts of witch hazel bark, golden seal root (*Hydrastis canadensis*), and lobelia leaves—a strong decoction being made from the first two, then the lobelia leaves added—as a lotion in ophthalmia, with such success that he succeeded in curing even the most obstinate and long-standing cases; and he adds that other practitioners, to whom he communicated this fact, have confirmed it.

The decoction was also highly recommended by Dr. James Fountain, of Peekskill, N.Y., and Dr. N. S. Davis, in hemorrhage of the lungs and stomach.

Besides the colourless, or distilled “extract,” there are several other popular or proprietary preparations, mostly made, probably, by dissolving the soluble parts of the residue left on distilling the bark or leaves.

Constituents of the Flowers of *Rosa Centifolia*. M. Niederstadt. (*Landw. Versuchs-Stat.*, xxix. 251.) Red roses were found to contain 86 per cent. of water, 3·64 per cent. of nitrogen, and 3·5 per cent. of ash; in white roses were found 91·7 per cent. of water, 3·16 per cent. of nitrogen, and 3·9 per cent. of ash. The composition of the ash of each is given below:—

	Red Roses.	White Roses.
Potash	43·81	42·05
Soda	1·12	1·53
Lime	6·02	8·05
Magnesia	6·27	6·41
Ferric Oxide and Alumina	1·05	1·97
Phosphoric Acid	16·47	11·32
Sulphuric Acid	7·81	5·07
Silica	1·49	2·40
Chlorine	0·69	4·28
Carbonic Acid	15·38	17·83

Adulterated Saffron. (*Chem. and Drugg.*, 1883, 563.) Under the name of Alicante saffron, an article has recently been introduced into commerce which, according to the *Journal de Pharmacie d'Anvers*, is offered in seven different qualities, designated by the numbers 0 to 6. No. 0 contains about 30 per cent. of true saffron; No. 6 does not contain more than 4 to 5 per cent. On macerating No. 6 in water, it yields a shade and intensity of colour very much the same as saffron; the only suspicious indication is the less pronounced odour. The weight of the ash (9 per cent.) does not much differ from that of saffron, 8 per cent.) The false fibres cannot be distinguished by touch; their form seems very natural, except that their thickness is the same all along, and they are never divided in three branches; the stigmata of saffron, on the contrary, become thinner towards the base, terminate in a yellow thread, and three are generally united. In the artificial saffron there is no yellow thread. The fibres of this latter swell in alcohol, ammonia, and nitric acid. They are more completely decoloured than saffron. The false saffron consists of marigold flowers rolled longitudinally, and impregnated with a substance insoluble in water. Dr. Biel, of St. Petersburg, has found an easy means of detecting the fraud: by treating the saffron with petroleum ether, which will not take any colour from pure saffron, but receives a citron tint from the false. He has further found that the flowers of marigold were coloured by dinitro-cresylate of soda, and afterwards impregnated with oil. This colouring matter yields the same shade as saffron; its colouring power is very intense; it is cheap, harmless, and has been employed for some time for colouring liqueurs.

Note on a Sample of Sophisticated Saffron. J. Hart. (*Pharm. Journ.*, 3rd series, xiv. 738.) The suspected saffron was very dry; but there was nothing in the colour to indicate the presence of mineral matter. There was no perceptible effervescence on the addition of dilute HCl, either in the powder or the saffron, proving

absence of CaCO_3 . Ten grains of the saffron, freed as much as possible from powder by shaking and rubbing, yielded 2 grains, equalling 20 per cent., of ash, showing 14·88 per cent., of adulteration, even after being freed from all loose powder, when compared with a dry specimen of pure saffron. Ten grains of the loose powder (containing a small quantity of saffron) were then incinerated, and yielded 6·5 grains of ash, the bulk of which was insoluble in boiling HNO_3 , and gave the characteristic flame of barium. An attempt to ascertain the exact nature of the ash from a further 10 grains of powder was frustrated by an unfortunate accident resulting in the loss of the whole. The remaining saffron and powder were then incinerated, and the ash analysed with results as given below. This ash of course contains a proportion of normal ash, but the source of adulteration is proved beyond doubt.

Constituents of ash expressed as parts per 100 :—

BaSO_4	64·28
CaSO_4	14·57
Al_2O_3 (containing a trace of iron)	10·71
Salts of K and Na	9·28
	<hr/>
	98·84

Inulin in the Bracts of the Artichoke. MM. Pistone and De Regibus. (*Pharm. Journ.*, 3rd series, xiv. 52.) The presence of a perceptible amount of inulin in the bracts of the artichoke (*Cynara Scolymus*) is recorded by the authors in the *Journal of the Royal Turin Academy of Medicine*. The bracts were boiled in water until a dark green sap could be expressed from them, which reduced Fehling's solution with difficulty. This was again boiled, and filtered off while hot. If slowly cooled, there was precipitated, after some time, a white flocculent substance, which, after repeated washing in boiling water and alcohol, proved to be nearly identical with Sach's spherocrystals of inulin. It is not coloured by iodine, and turns the plane of rotation in the polariscope to the left, even in the presence of a dilute acid.

Constituents of Nymphææ. W. Grüning. (*Archiv der Pharm.* [3], xx. 582–605, and 736–761; *Pharm. Journ.*, 3rd series, xiv. 49.) The following tabular arrangement of the author's analytical results is given :—

	Nuphar.		Nymphaea.		
	Rhizome.	Seeds.	Rhizome.	Roots.	Seeds.
Moisture	10.30	11.31	10.56	6.71	9.06
Ash	5.19	0.89	5.47	10.07	2.12
Fat	0.77	0.51	0.49	0.59	1.06
Resin soluble in Ether	0.60	2.11	1.55	1.38	0.21
Resin insoluble and Phlobaphene	1.54	1.97	2.52	0.30	0.42
Mucous matter with traces of Albumen	1.81	0.26	3.62	6.94	1.47
Tannin	2.27	0.72	10.04	8.73	1.10
Matter not precipitated by Copper Acetate	0.54	—	0.03	1.00	0.86
Glucose	5.98	—	6.25	5.62	0.94
Saccharose	1.21	—	—	—	—
Substances soluble in water indirectly estimated	4.40	1.38	1.92	3.60	1.18
Metarabin, etc.	2.50	0.86	3.26	6.11	0.46
Soluble in dilute Soda Solution, not precipitated by Alcohol	8.36	0.59	5.80	8.60	1.51
Starch	18.70	44.00	20.18	4.09	47.09
Pararabin	3.81	—	1.80	1.20	—
Albumen	3.99	7.08	4.06	7.21	9.79
Lignin, etc.	14.82	6.45	14.26	8.99	4.78
Intercellular substance	—	3.22	—	2.47	0.98
Cellulose	14.11	13.21	9.36	17.42	11.66

Alkaloids.—The author succeeded in separating an alkaloid from *N. luteum*, and also from *N. alba*. Dragendorff had already isolated it in the case of the latter. The chemical and physical properties appear to be identical, as well as their behaviour towards group reagents, but in their colour reactions there is a decided difference: *Nupharine*, as the alkaloid of *N. luteum* is named by the author, is a whitish brittle mass, which on being rubbed sticks to the fingers. It solidifies at 40–45°; at 65° it is of a syrupy consistence; it is easily soluble in alcohol, chloroform, ether, amyl alcohol, acetone, and in dilute acids, but almost insoluble in light petroleum. The acid solution has a peculiar and characteristic smell, and is acted on by most of the group reagents for alkaloids, potassium chromate, picric acid, iodide of potassium, etc. With trouble the author discovered colour reactions which distinguish it from all other alkaloids. A small quantity when dissolved in dilute sulphuric acid and warmed on a steam-bath, assumes a brown colour, which gradually passes into a dark black-green; the addition of a very few drops of water causes the colour to disappear, with precipitation of a voluminous yellow-brown substance. The acid solution when placed over sulphuric acid and lime, after ten or twelve days, becomes a magnificent green, increasing in intensity for about another ten days,

until it becomes a dark blue-green ; a few drops of water cause the colour to disappear immediately, with separation of a yellow crystalline precipitate, which, when removed from the filtrate, liquefies in air, or over sulphuric acid, with return of the green colour. This experiment can be repeated frequently with the same sample.

The alkaloid is tasteless, but its acid solution is intensely bitter. It has not yet been obtained crystalline.

The formula given to the alkaloid is $N_3 C_{18} H_{34} O_2$. The formula requires an equivalent of 300 ; by experiment it was found to be 285.5 ; the differences are attributed to impurities in the sample. The same formula has been given by Pelletier and Couerbe to menispermine and paramenispermine ; the three alkaloids are probably isomeric. With Wild's polariscope, nupharine is optically inactive. Its physiological action was tried on cats, without toxic effect.

The alkaloid of *Nymphaea alba* does not give the green reaction with dilute sulphuric acid, but on the contrary it gives the following, which are not given by nupharine. Concentrated sulphuric acid and potassium chromate colour its solution first red-brown, after some hours clear green. Concentrated sulphuric acid alone produces a red-brown, which passes into grey. Frohde's reagent colours it first red, then dirty green. The alkaloids are not present in the seeds of *N. luteum* nor in the blossoms or seeds of *N. alba*.

In the second paper the author continues the examination of the two plants of the family, *N. alba* and *Nuphar lutea*. As far as examination of two members of it allows him to come to a conclusion, he thinks that the tannin contained in them is their most important constituent from a chemical point of view ; after that the alkaloids, and then the starch. The tannins of the two species differ slightly in their properties, but are closely related in their reactions. They both differ from tannin derived from other sources, in yielding characteristic secondary products. The insoluble tannin found in them is very characteristic, but a somewhat similar substance was found by Löwe in oak-bark, and as methods of examination are now in use which were not then employed, it is probable that the substance has often escaped detection, and will be more frequently found in the future.

The insoluble tannin of oak-bark is the anhydride of the soluble acid ; the insoluble acid of *Nymphaea* appears to be a hydrate of its phlobaphene, and the author thinks it more than probable that the phlobaphene is an intermediate product between the soluble and insoluble tannin.

The tannins of *Nymphaea* are also notable for yielding many

secondary products, which have been individually found in other tannins, but their presence together has not been hitherto noted. Ellagic and gallic acids are easily obtained; another substance, which rapidly absorbs oxygen from the air, and passes into a body of the nature of phlobaphene; and a second substance, which by similar absorption of oxygen passes into two bodies, or assumes two phases with properties similar to chlorophyll. Sugar was looked for in consequence of Strecker and others having asserted it to be one of the derived products of tannin from gall-nuts and oak-bark, but it was not found.

The author's experiments lead him to believe that the molecule of the tannin obtained from *Nymphæa* is of a very complex nature.

Constituents of Chamomile Flowers. L. Naudin. (*Bull. de la Soc. Chim.*, xli. 483.) Light petroleum spirit extracts from chamomile flowers two crystallizable bodies, which may be separated from each other by repeated treatment with absolute alcohol. The author has examined the compound insoluble in cold alcohol, for which he suggests the name "*anthemen*." Its composition is represented by the formula $C_{16} H_{38}$. It forms delicate needles soluble in ether, petroleum, chloroform, carbon bisulphide, and hot alcohol, and fusing at $63-64^{\circ} C$.

Constituents of the Leaves of *Ceanothus Americanus*. J. H. M. Clinch. (*Amer. Journ. Pharm.*, 1884, 131.) The author's analysis of these leaves shows the absence of alkaloids and glucosides, and the presence of two resins, a small quantity of fixed oil, glucose, gum, extractive and colouring matters, an essential oil and a tannin identical with or closely related to caffeotannic acid.

Adulteration of Conium. M. Mader. (*Pharmaceut. Zeitung*, 1883.) A parcel of this herb examined by the author proved to consist entirely of two other very common umbelliferous plants, *Anthriscus sylvestris* and *Oxerophyllum temulum*. This herb, when boiled with solution of caustic soda, gave off a hay-like instead of a mousy odour; and this circumstance having roused the author's suspicion, caused him to make a closer examination of the parcel in question, which soon led to the identification of the plants named.

Maté, or Paraguay Tea. T. Peckolt. (*Pharm. Journ.* 3rd series, xiv. 121; from *Zeitschr. oesterr. Apoth. Ver.*) This tea is made from *Ilex paraguayensis*, indigenous in the South American region which lies between 18° and 30° south latitude; it has been planted, and seems to succeed well in the Cape of Good Hope, Spain, and Portugal. It is stated, on experimental evidence, that six different species of the *Ilex* are used in the preparation of this

tea. In some cases the leaves are dried in ovens, in others they are roasted. The author has analysed the fresh leaves, etc., of the *Ilex paraguayensis* from the Orgu Mountains in Neufreiburg, with the following results :—

In 1,000 grams of air-dried leaves :—

	Grams.
Stearoptene	0·021
Volatile Oil, extracted by Ether	0·099
Fat and Wax	19·800
Green colouring matter	10·900
Chlorophyll and Soft Resin	20·966
Brown Acid Resin	48·500
Caffein	6·398
Bitter extractive matter	2·033
Sugar	39·266
Extractive matter and Organic Acids . .	8·815
Maté-tannic Acid, pure	27·472
Maté-iridic Acid, crystallized	0·024
Albumen, Organic Acid, Inorganic Salts, Dextrin, etc.	47·660
Moisture	166·660
Cellulose and Loss	601·886

In 1,000 grams of air-dried little twigs of the *Ilex paraguayensis* from Neufreiburg the author found :—

	Grams.
Green Soft Resin and Chlorophyll	9·400
Brown Acid Resin	19·700
Caffein	2·579
Maté-tannic Acid and extractive matter .	30·000
Extract, Cellulose and Water	938·321

In 1,000 grams of air-dried leaves from Parana, from which the roasted maté is prepared, the following substances were found :—

	Grams.
Stearoptene	0·019
Volatile Oil, obtained by Ether	4·179
Fat and waxy substance	18·800
Green colouring matter	10·800
Chlorophyll and Soft Resin	51·200
Brown Acid Resin	84·500
Caffein	16·750
Aromatic substance	2·500
Maté-tannic Acid, pure	44·975
Maté-iridic Acid, crystallized	0·025
Extractive matter	65·130
Saccharine extractive matter, Sugar . .	6·720
Albumen, Salts, Dextrin, etc.	36·102
Moisture	104·600
Cellular matter	557·700

In 1000 grams of commercial maté from Parana, the author found:—

	Grams.
Volatile Oil, obtained by Ether	0·026
Caffein	5·550
Chlorophyll and Soft Resin	6·102
Brown Acid Resin	25·500
Maté-tannic Acid, pure	16·785
Pyromaté-tannic Acid	1·465
Maté-viridic Acid, crystallized	0·024
Extractive matter	16·610
Caramel-like extractive matter	1·370
Salts, Dextrin, etc.	18·189
Cellular matter and Moisture	908·379

The Occurrence of Caffeine in the Leaves of Tea and Coffee grown at Kew Gardens. C. Schorlemmer. (From a paper read before the Manchester Literary and Philosophical Society.) The author has examined specimens of fresh leaves of tea and coffee grown at Kew and supplied to him by Professor Dyer. He found caffeine in *Thea viridis* and *Thea assamica*, a smaller proportion in the leaves of *Coffea arabica*, a mere trace in *Coffea laurina*, but none at all in the old leaves of Liberian coffee. Specimens of the leaves of the kât (*Catha edulis*) were examined for caffeine with a negative result.

As caffeine is used in medicine, the author considers it probable that this alkaloid will before long be manufactured from Peruvian guano, since E. Fischer has shown that guanine may be readily converted into theobromine, and this into caffeine.

Constituents of Canella Alba. J. P. Frey. (*Amer. Journ. Pharm.*, 1884, 1.) The author isolated from canella bark 1·28 per cent. of volatile oil, 8·2 per cent. of resin, 6–8 per cent. of mannite, 8·9 per cent. of ash, starch in considerable quantity, a bitter principle, albumen and cellulose. The volatile oil consists of an oil heavier than water, and another which is lighter than water.

Doundaké. MM. Bochefontaine, Fériss and Marcas. (*Comptes Rendus*, xcvi. 272.) This is the name of a West African bark used by the natives as a febrifuge. It is very bitter in taste, of an orange-red colour, and composed of lamellæ which are easily detached from one another. It is supposed to be the produce of a shrub belonging to the order *Rubiaceæ*. The authors have isolated from it a bitter poisonous alkaloid, which they propose to name “doundakine.”

Andromeda Polifolia. P. C. Plugge. (*Archiv der Pharm.*, xxi. 813.) Andromedotoxin, the poisonous principle isolated some time ago by the author from the Japanese plant, *Andromeda japonica*, is now shown by him to occur also in *Andromeda polifolia*, which grows wild in some parts of Germany. Another crystalline body isolated from the same plant is regarded by the author as probably identical with *asebotin*, a substance obtained by Prof. Eykman from the Japanese species.

Tradescantia Erecta, a New Styptic. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 576.) This Mexican plant, now cultivated at Versailles, is stated to possess very valuable styptic properties, and to be superior in this respect to ferric chloride.

Palillo. MM. Duges and Armendaris. (*Bull. Soc. Bot.* [2], v. 233.) The Mexican plant known by this name appears to be *Croton morifolius*. An infusion of the leaves is used by the natives as a stomachic. The tincture of the leaves is said by the authors to be an excellent remedy for neuralgia, for which it is used both externally and internally, its dose being 10 to 15 drops. The seeds yield a fatty oil possessing strong purgative properties. Two or three drops of this oil are an efficient dose.

Brazilian Plants. T. Peckolt. (*Zeitschr. des oesterr. Apoth. Ver.*, xxi. 182, 197, and 214.) The author publishes a useful comparative list of popular and scientific names of the economic plants of Brazil. As this list cannot be abstracted, we must refer the reader to the original source or to a reprint in the *Pharmaceutical Journal*, 3rd series, xiv. 85-88.

Artemisia Abrotanum. M. Craveri. (*Union Pharmaceutique*, xxiv. 410.) The author reports that this plant contains a crystallizable alkaloid possessing antipyretic and antiseptic properties. He proposes to name this body "*abrotine*."

Pinus Sylvestris. A. B. Griffiths. (*Chemical News*, xlix. 95.) The stem, leaves, and cones of this tree are said to contain phenol which can be extracted by means of warm water, and detected by the usual reactions.

Lythrum Salicaria. Dr. Campardon. (*Bull. Gén. de Thérapeutique*.) The author reports very favourably on the action of this plant in acute and chronic inflammations of the gastro-intestinal mucous membrane, and attributes its effects to the tannin and mucilage contained in it. The infusion is made of the strength of 30 parts of leaves and stalks to 1,000 of water. Of the powder, the dose is 1 gram to be given three times a day in a wafer.

The Seeds of *Withania Coagulans*. S. Lea. (*Pharm. Journ.*, 3rd series, xiv. 606.) The author has demonstrated the presence of a rennet ferment in these seeds. Taking equal weights of the seeds, he extracted them separately for twenty-four hours with equal volumes of water, a 5 per cent. solution of sodium chloride, a 2 per cent. solution of hydrochloric acid, and a 3 per cent. solution of sodium carbonate. Equal volumes of each of the above were added in an acid, alkaline, and neutral condition to equal volumes of milk, and heated in a water-bath at 38° C. The milk was rapidly coagulated by the salt and sodium carbonate extracts, much less rapidly by the other two; of the four, the salt extract was far the most rapid in the action. All subsequent experiments have shown that a 5 per cent. solution of sodium chloride is the most efficient in the extraction of the active principle from the seeds.

That the constituent which possesses the coagulating power is a ferment closely resembling animal rennet may be seen from the following observations:—

1. A portion of the 5 per cent. sodium chloride extract loses its activity if boiled for a minute or two.

2. The active principle is soluble in glycerin, and can be extracted from the seeds by this means; the extract possesses strong coagulating powers even in small amounts.

3. Alcohol precipitates the ferment body from its solutions; and the precipitate, after washing with alcohol, may be dissolved up again without having lost its coagulating powers.

4. The active principle of the seeds will cause the coagulation of milk when present in very small quantities, the addition of more of the ferment simply increasing the rapidity of the change.

5. The coagulation is not due to the formation of acid by the ferment. If some of the active extract be made neutral or alkaline and added to neutral milk, a normal clot is formed, and the reaction of the clot remains neutral or faintly alkaline.

6. The clot formed by the action of the ferment is a true clot, resembling in appearance and properties that formed by animal rennet, and is not a mere precipitate.

A Peculiar Property of Linseed Meal. A. Jorissen. (*Bull. Acad. Roy. Belg.* [3], v. 750.) The author records the observation that a mixture of linseed meal and warm water, when allowed to stand for some time at a temperature of 25° C., and then distilled, yields a distillate containing hydrocyanic acid. The acid is a decomposition product and does not pre-exist in the seed. A mixture of amygdalin, linseed meal, and water, is stated to develop an odour

of bitter almonds, a fact which points to the presence in linseed of a substance resembling emulsin.

Waras. W. T. Thiselton Dyer. (*Pharm. Journ.*, 3rd series, xiv. 969.) An examination made by the author of authentic fruit-bearing specimens of the waras-yielding plant recently obtained from Major F. M. Hunter, affords definite proof of this plant being really that described by J. G. Baker, in the "flora of tropical Africa," as *Flemingia rhodocarpa*.

Professor Oliver, however, has found that a *Flemingia* apparently confined to South India, *F. Grahamiana*, is not specifically distinguishable from *F. rhodocarpa*; the pods are in fact clothed with the same peculiar epidermal glands so characteristic of that species. The "waras" plant is therefore really to be found in India after all.

In creating a new species for the "waras" plant, J. G. Baker seems to have neglected the comparison of the material he was working upon with specimens of the species occurring in so remote and botanically widely severed an area as the southern part of the Indian peninsula.

The author appends Major Hunter's interesting notes on "waras" collected at Harrar in February and March, 1884.

"In the neighbourhood of the city 'waras' is not now raised from seed sown artificially, and it is left to nature to propagate the shrub in the surrounding terraced gardens. The plant springs up, among jowari, coffee, etc., in bushes scattered about at intervals of several yards more or less. When sown, as among the Gallas, it is planted before the rains in March. If the soil be fairly good a bush bears in about a year. After the berries [pods] have been plucked, the shrub is cut down to within six inches of the ground. It springs up again after rain and bears a second time in about six months, and this process is repeated every second year, until the tree dies. Rain destroys the berry [pod] for commercial purposes, it is therefore only gathered in the dry season ending about the middle of March. The bush grows to a maximum height of six feet, and it branches close to the ground. The growth is open and the foliage sparse. Each owner has a few acres of land.

"In the middle of February, 1884, the following processes were observed:—

"The leaves [? fruiting shoots] of some plants were plucked and allowed to dry in the sun for three or four days. (The picking is not done carefully, and a considerable quantity of the surrounding twigs, etc., is mixed with the berries [pods].) The collected mass

was placed on a skin heaped up to about six or eight inches **high**, and was tapped gently with a short stick about half an inch **thick**. After some time the pods were denuded of their outer covering of red powder, which fell through the mass on to the skin. The upper portion of the heap was then cleared away and the residual reddish green powder was placed in a flat woven grass dish with a sloping rim of about an inch high. This receptacle was agitated gently and occasionally tapped with the fingers, the result being the subsidence of the red powder and the rising to the surface of the chaffy refuse, which latter was carefully worked aside to the edge of the dish and then removed by hand. This winnowing was continued until little remained but red powder. (No great pains are even taken to eliminate *all* foreign matter.) A rotl was sold in 1884 for about 13 piastres = 1 rupee 10 as. nearly.

“‘Waras’ is sent to Arabia, chiefly to Yemen and Hadhramaut, where it is used as a dye, a cosmetic, and a specific against cold. In order to use it, a small portion of the powder is placed in one palm and moistened with water, the hands are then rubbed smartly together, producing a lather of a bright gamboge colour, which is applied as required.”

Hazigne, a New Remedy for Skin Diseases. H. Baillon. (*Journal de Pharmacie*, June, 1884, 456.) Hazigne is a Malagasy plant, the fruits of which yield an oil and the stem a resin, which are used by the natives as a remedy in certain skin diseases, such as leprosy, the itch, and ulcers. The oil obtained from the seeds is also used as food and for lamps. The hazigne is a handsome tree belonging to the *Guttiferae*, and is named *Symphonia fasciculata*. The fruit is known to the natives by the name of “voa-sou-vouara.”

Sizygium Jambolanum. M. Banatrala. (*Répertoire de Pharmacie*, 1884, 169.) The fruit of this East Indian plant, belonging to the order *Myrtaceae*, is coming into favour as a remedy for diabetes. The author reports three cases in which its administration was followed within forty-eight hours by the disappearance of the sugar and a notable diminution in the quantity of the urine secreted. It was also observed that amylaceous food could be given during this treatment without interfering with the result.

A Poisonous Vanilla. M. Jaillet. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 527.) The injurious effects which vanilla has been observed to produce in some instances receives some explanation by the author's statement that in Réunion vanilla is grown on the stems of *Jatropha Curcas*, and feeds on the milky juice of this poisonous member of the *Euphorbiaceae*.

Sabal Serrulata. J. Moeller. (*Pharm. Centralhalle*, 1883, No. 15. From *Amer. Journ. Chem.*) The dried fruit of the saw palmetto is described by the author as being oblong ovate, 10 to 15 mm. ($\frac{1}{2}$ to $\frac{3}{4}$ inch) long, 5 to 9 mm. ($\frac{1}{4}$ to $\frac{1}{2}$ inch) broad, bluntly pointed at the base, externally blackish brown, netted-wrinkled, weighing about .5 gram, inodorous and tasteless, and containing a shrivelled seed. The pericarp is 1 mm. thick, and consists of three well-defined layers of nearly equal thickness: the blackish brown resinous epicarp, the yellowish green mesocarp, and the yellowish brittle endocarp, composed of sclerenchyma. Soaked in water, the mesocarp swells considerably, and the epicarp somewhat less. Both tissues are formed of thin-walled cells; those of the latter are filled with a brown mass; those of the former colourless or brownish, and surrounding numerous fibrovascular bundles. The thin-walled cells of the testa contain a red-brown mass. The endosperm is hard and hornlike, swells rapidly in water, and consists of a peculiar parenchyma, which becomes gelatinous by potash.

Iron salts colour the contents of the cells of the epicarp blue, but scarcely affect those of the testa. The contents of the latter are soluble in alkalies; those of both tissues insoluble in water. The mesocarp contains crystals of calcium oxalate, also remnants of protoplasma, which are also found in the endosperm.

Xanthium Strumarium. M. V. Cheatham. (*Amer. Journ. Pharm.*, 1884, 134.) The cocklebur is one of the first plants making its appearance in the spring, and the hogs, which in some of the southern and western States are allowed to run at large during the fall and winter to eat the mast, are very fond of the young plant, but almost invariably die after eating them; warm lard, and other fatty substances, being used as antidotes with only poor success.

The author extracted the bruised dried fruit, 195.21 grams, with benzene, and obtained 29 grams of a yellowish, non-drying fixed oil, having the specific gravity .900, and a peculiar odour somewhat resembling that of freshly extracted flaxseed oil; from the soap prepared with it, oleic acid was obtained, and glycerin was found in the mother-liquor of the soap.

With strong alcohol a resinous extract was obtained. The portion soluble in diluted acetic acid gave precipitates with potassium-mercuric iodide, with iodine and with tannin, but not with picric acid; ferric chloride produced a green colour, and sugar followed by a drop of sulphuric acid caused a yellowish colour, slowly changing to carmine and to bright violet-red. Ether extracted from the

acid solution the principle giving these reactions; but the small quantity subsequently taken up by ether from the same solution rendered alkaline by potash, did not give these reactions.

Of the resinous substance left after treatment with acidulated water, 4 grams were given to a small dog, producing no visible effects. This substance was freely soluble in ether and alcohol, and slightly soluble in potash and ammonia; ferric chloride added to the alcoholic solution gave a deep green colour, probably due to a little tannin.

The principle obtained above, though probably not pure, the author thinks may be different from the xanthostrumarin of Zander (*Amer. Journ. Pharm.*, 1881, p. 271), the latter being precipitated with picric acid, and not precipitated with tannin.

The Cacao Tree. M. Boussingault. (*Comptes Rendus*, xvi. 1395-1399. From *Journ. Chem. Soc.*) The cacao tree requires a rich, deep, moist soil, in shaded localities, close to the sea or to rivers. The tree flowers when about thirty months old, and the fruit is ripe about four months after the fall of the flowers. The weight of the fruit varies from 300-500 grams, and after picking they are exposed to the sun during the day, and placed under sheds at night. Active fermentation soon sets in, but if allowed to proceed too far is injurious. The cacao is decorticated by careful roasting, which also develops an aroma, due to a minute quantity of a volatile oil. Examination of Trinidad cacao showed the presence of butter, starch, theobromine, asparagine, albumen, gum yielding mucic acid, tartaric acid free and combined, soluble cellulose, ash, and indeterminate substances. Decorticated cacao, slightly roasted and separated from the seeds, forms the basis of chocolate, which, when genuine, consists only of cacao and sugar. The superiority of chocolate over tea, coffee, maté, etc., is due to the fact that in addition to theobromine, it contains in a small bulk a large quantity of food materials, and indeed approximates in composition to milk.

Cocoa. M. Boussingault. (*Ann. Chim. Phys.* [5], xxviii. 433-456; *Journ. Chem. Soc.*, 1884, 202.) The cocoa plant rarely flowers before it is thirty months old, but the first flowers are generally destroyed, as the planters do not permit the plants to bear fruit before they are four years old. 100 kilos. of fresh fruit yield from 45 to 50 kilos. of dry cocoa. In Venezuela, after a plant is seven years old, it yields 0.75 kilo. annually. In Magdalena a tree yields two kilos. of dry cocoa per annum. The kernel of the species *Montaraz* contains: butter, 53.3; albumen, 12.9;

theobromine, 2·4; gum and tartaric acid, 6·7; cellulose, lignose, and starch, 9·1; ash, 4·0; water, 11·6 per cent. The ash consists chiefly of phosphate of calcium, magnesium, and potassium; it also contains silica, carbonic and sulphuric acids. The husk has the following percentage composition: butter, 8·9; nitrogenous matter, 14·25, containing 2·8 N; gum, 12·12; tartaric acid and tannin, 5·05; ash, 6·89; water, 12·18; lignose, cellulose, and other compounds not estimated, 45·61. The process of decortication is generally accomplished by means of gentle heat. The following table shows the composition of Trinidad cocoa, decorticated—*A* by heat, *B* without heating :—

	<i>A.</i>	<i>B.</i>
Butter	54·0 .	49·9
Starch and Glucose	2·5 .	2·4
Theobromine	3·6 .	3·3
Asparagine	trace .	trace
Albumen	11·8 .	10·9
Gum	2·5 .	2·4
Tartaric Acid	3·7 .	3·4
Tannin	0·2 .	0·2
Soluble Cellulose	11·5 .	10·6
Ash	4·4 .	4·0
Water	— .	7·6
Not estimated	5·8 .	5·3

Cocoa butter is a white solid which melts at 30° and solidifies at 23°. The gum resembles gum arabic in appearance, and also yields mucic acid when treated with nitric acid. It is powerfully dextrogyrate.

The Seeds of *Camellia Oleifera*, s. *C. Drupifera*. H. McCallum. (*Pharm. Journ.*, 3rd series, xiv. 21.) The author obtained from the seeds, deprived of the husk, by means of ether, forty-four per cent. of a somewhat viscid yellowish oil, odourless and having an unpleasant after taste. In China it is known as *cha yan*, or *tea oil*, and is chiefly used as a hair dressing, and as an illuminant. In addition to the oil, about ten per cent. of a glucoside, giving all the reactions of *saponin*, was obtained from the seeds. Even then the marc, on being shaken with water, gave a persistent lather. This saponin is a friable, amorphous, white powder, having only a slight creamy tinge, and a sweetish, afterwards bitter, disagreeable and biting taste. Almost odourless when dry, it has a peculiar, disagreeable odour when dissolved in water. The dust irritates the nostrils. It is insoluble in ether, sparingly soluble in absolute alcohol, freely in 84 per cent. alcohol, and very

soluble in water, the latter solution having an acid reaction, and giving white precipitates with barium hydrate, basic lead acetate, and, on heating, with normal lead acetate. The solution emulsifies oils and chloroform, and, shaken with mercury, the latter is finely divided. It gives 9 per cent. of ash. Heated with hydrochloric acid, a flocculent, white precipitate (sapogenin) is thrown down, and a glucose remains in solution. The saponin was prepared by exhausting the seed, deprived of oil, with 84 per cent. alcohol, concentrating the tincture to a syrupy liquid, precipitating with absolute alcohol, redissolving in 84 per cent. alcohol, treating with animal charcoal, and filtering.

The press cake left on expressing the oil is called *cha-tsai-peng*, and its powder *cha-tsai-fau*. These are used for washing, for removing grease stains, for destroying worms, grubs, etc., and for poisoning fish, when kept in tanks.

The Beans of Soja Hispida. E. Meissel and F. Böcker. (*Monatsh. Chem.*, iv. 349-368; *Journ. Chem. Soc.*, 1883, 1024.) The Soja bean, imported from Japan, like all leguminous fruits, contains a large amount of proteids, and is moreover very rich in fatty constituents. The authors have made an elaborate investigation of these fruits, the results of which are summarized as follows:—

1. The Soja bean contains no gluten proteids, and only very small quantities of amido compounds.

2. By exhaustion with dilute aqueous potash, or with pure water, or with a 10 per cent. solution of sodium chloride, it yields a casein nearly resembling the legumin of ordinary leguminous fruits, and containing, when freed from ash, 51.24 per cent. C, 6.99 H, 16.38 N, 0.47 S, and 24.92 O.

3. The solution filtered from the casein deposits, on being boiled, an albuminous substance differing essentially in composition and properties from ordinary albumen, but closely resembling the albumen of peas. This albumen is perhaps formed by transformation of the casein, and contains 52.58 per cent. C, 7.00 H, and 17.27 N.

4. The mother-liquors of the casein and albumen, treated with copper salts, yield nitrogenous precipitates, consisting for the most part of a cupric compound of casein which has escaped precipitation, contaminated with non-azotised substances.

5. The residue left after exhausting the beans with dilute potash contains nitrogen belonging to casein which has been rendered insoluble. By prolonged keeping, or by roasting of the beans, the quantity of this insoluble casein is increased, and finally the whole of the casein is converted into the insoluble modification.

6. Of the nitrogenous constituents of the Soja beans which are soluble in dilute potash, more than 90 per cent. consists of casein, and 1.5 to 2 per cent. of albumen.

7. Combustion with soda-lime cannot be employed for estimating the nitrogen of the casein, but is well adapted for estimating the amount of nitrogen in the entire bean.

8. The portion of the Soja bean soluble in ether consists of 90–95 per cent. neutral fat, and 5–10 per cent. cholesterin, lecithin, wax, and resin.

9. The other non-azotised constituents of the bean are cellulose, a small quantity of sugar, about 10 per cent. dextrin, and less than five per cent. starch in very small rounded separate grains.

10. The composition of the Soja bean is, in round numbers, as follows :—

Water	10.0 per cent.
Soluble Casein	30.0 „
Albumen	0.5 „
Insoluble Casein	7.0 „
Fat	18.0 „
Cholesterin, Lecithin, Resin, Wax	2.0 „
Dextrin	10 „
Starch (less than)	5 „
Cellulose	5 „
Ash	5 „
Sugar, Amides, etc.	small quantities.

The Economic Application of Sea-weed. E. C. C. Stanford. (*Pharm. Journ.*, 3rd series, xiv. 1009–1012, 1026–1029, and 1049–1052.) An elaborate essay terminating with the following conclusions :—

1. The only way to effectually utilize sea-weed is to import it in the raw state.

2. By following the wet process, the additional cost is fully made up by the greatly increased amount of iodine and salts obtained from the aqueous solution, leaving two-thirds of the plant for further treatment.

3. That by extracting from this the algin and the cellulose, we utilize the whole plant, and obtain two new products of considerable commercial importance.

4. That the process is extremely simple, and requires no extravagant plant; nor do operations on the large scale present any serious practical difficulties.

5. That the new substance, algin, has very remarkable properties,

which may find many applications not yet known, when it can be put on the market.

6. That the demand for such a substance in fixing and mordanting fabrics alone is enormous.

Our annual export of textile manufactures and yarns is valued at £40,000,000, or more than half the value of our total exports; and a large portion of this requires some dressing material to fit it for the market. We import about £200,000 worth of gum arabic, a good deal of which is used for this purpose; and the war in the Soudan is raising its price and making it scarce.

7. That the supply of raw material is almost unlimited. Sea-weed damaged by rain is equally available for the manufacture of algin.

The paper is full of interesting details, for which reference must be made to the original article, as they cannot be usefully abstracted.

Proximate Analysis of the Seeds of *Amomum Melegueta*. Dr. J. C. Thresh. (*Pharm. Journ.*, 3rd series, xiv. 798.) The author's results are summarized in the following table:—

Soluble in Petroleum Ether.	Volatile Oil	63
	Active Principle	3.39
	Resin	50
Soluble in Alcohol.	(?) Acid	80
	Tannin	99
	Phlobaphene	50
Soluble in Cold Water.	Resins	63
	Mucilage	22
	Organic Acids, etc., precipitated by Lead Acetate .	38
Taken up by successive treatment with dilute alkali, boiling water, and dilute acids.	Albuminoid	1.30
	Metarabin	79
	Starch	27.30
	Pararabin	3.12
	Albuminoids not soluble in water	4.10
Lignin, etc.	Other substances taken up by acid	6.59
		23.70
Cellulose		5.65
Ash		3.86
Moisture		16.05
		<hr/> 100.00

Beggiatoa Alba: the so-called Sewage Fungus. A. W. Bennett. (*Pharm. Journ.*, 3rd series, xiv. 878.) Under the name

of "sewage fungus," a peculiar organism is familiar to sanitary engineers as occurring abundantly and universally in the effluent water from sewage-works, forming dense flocculent greyish white masses attached to the bottom and sides of the channel, or to ordinary green algæ. Under the microscope it is seen to consist of an immense quantity of colourless threads, with but little or no chlorophyll, full of granular protoplasm, and containing a number of bright, strongly refractive granular particles. This is *Beggiatoa alba*, Vauch, an interesting and remarkable organism.

Zopf (*Die Spaltpilze*, Breslau, 1883, p. 76) describes the filaments as varying greatly in diameter, from 1 to 5 mm., as being unbranched and unseptated, and as characterized by the presence of strongly refractive globular particles, which have been determined by Professor Cohn of Breslau, and Professor Cramer of Zürich, to consist of pure sulphur. The author finds the filaments to be copiously branched, either dichotomously or laterally, and septated, either at the bases of the branches or elsewhere, and the cells to be frequently constricted above and below the septa. Still these low organisms are so often variable in points of structure of this kind, that further evidence of the constancy of these differences would be required before establishing a distinct species. The globules of sulphur the author finds most commonly situated one immediately below each septum; but sometimes towards the centre of a cell or more generally diffused. The systematic position of *Beggiatoa* is somewhat obscure. Zopf places it without hesitation in the Schizomycetes, with which it agrees in the absence of chlorophyll, and in a capacity for assuming different conditions, of which the ordinary form may be regarded as the leptothrix state. It also has corresponding bacillus, bacterium, coccus, and spirillum conditions. On the other hand, it is certainly closely allied to the Oscillatorieæ through *Orenothrix*, if this genus is to be retained, and if at certain times of the year it develops chlorophyll, which is probably the case, there would be no good characters by which to distinguish it from that class. If the trifurcate division of Thallophytes, which is a modification of Sachs,' is adopted into algæ, fungi, and proto-phytes, it will come under the third and lowest class.

The source of the sulphur contained in this organism is a very interesting question. It is a prevalent idea among sanitary engineers that the presence in water of the "sewage fungus" is a sure indication of partially decomposed sewage. But this would seem to be not necessarily the case. Zopf describes it as occurring in the effluent water from manufactories, especially sugar factories and

tanneries, and in thermal sulphur springs, as well as in drains. Luerssen (*Die Kryptogamen*, Leipzig, 1879, p. 24) gives as its habitat putrid water, noisome ditches, the effluents of manufactories, and mineral springs, especially all thermal sulphur springs, as those of the Alps and Pyrenees, Aix-la-Chapelle, baths at Vienna, etc. The author has seen *Beggiatoa alba* in large quantities on the waste ground about alkali works near Jarrow-on-Tyne. It therefore has probably the power of extracting the sulphur not only from decomposing organic matter, but also from mineral sulphates dissolved in the water; though the absence of chlorophyll would indicate that it is dependent on decaying organic substances for its carbon. Luerssen states that it has the power of developing sulphuretted hydrogen out of the sulphates in the water, and that water from thermal springs at Landeck containing this organism, preserved in a closed glass bottle for four months, contained from 5.07 to 7.24 c.c. to the litre of sulphuretted hydrogen, as against 0.92 to 1.65 c.c. per litre of fresh water.

The growth of the so-called "sewage fungus" must undoubtedly be regarded as evidence of the presence in the water of an abnormal amount of sulphates, derived either directly from sewage or from the substances used in precipitating it, or in other ways in manufactories. But there seems no reason to believe that it will itself have any injurious effect on the water. It is difficult to see how the sulphur once set free can again combine with hydrogen to form sulphuretted hydrogen, as long as the organism is growing in the water. Indeed, if allowed to accumulate, and periodically removed, it may tend to purify the water by abstracting from it some of the undue proportion of sulphur. Further examination of this interesting organism, and especially careful analyses of the ash, would be very desirable.

Constituents of *Lactarius Piperatus* and *Elaphomyces Granulatus*. T. Bissinger. (*Archiv der Pharm.* [3], xxi. 321-345.) The author has examined the chief constituents of these fungi. The fat extracted from *Lactarius piperatus* by ether, yielded (1) a non-volatile acid melting at 69-70°, having the formula $C_{15}H_{30}O_2$. This acid had previously been isolated from the fat of another fungus, *Agaricus integer*, by Thörner; (2) a volatile acid, which was proved to be butyric acid; (3) glycerol; (4) a substance crystallizing from alcohol in rhombic tables, melting at 36-37°, which is probably an alcohol of the formula $C_{14}H_{30}O$. The non-volatile acid appears to exist in the fat in the free state; the butyric acid is combined as a glyceride. An analysis of the ash

of *Lactarius piperatus* gave the following results, expressed as percentage numbers :—

K Cl	2.41
K ₂ SO ₄	10.40
K ₂ CO ₃	44.76
Na ₂ PO ₄	12.03
K ₂ PO ₄	18.87
Fe ₂ (PO ₄) ₃	1.57
Fe ₂ O ₃	3.55
Mn ₂ (PO ₄) ₂	0.38
Ca ₃ (PO ₄) ₂	0.47
Ca CO ₃	0.62
Mg CO ₃	2.66
Si O ₂	3.68

Mannitol was obtained from *Elaphomyces granulatus*; it has previously been found in *Agaricus integer* by Thörner.

The **Mineral Constituents of Fucus Vesiculosus and Fucus Serratus**. A. B. Griffiths. (*Chemical News*, xlviii. 197.) The author's recent analyses of the ash of these two sea-weeds shows the following composition :—

Fucus Vesiculosus (Bladder Wrack).

	I.	II.
Potash	14.91	14.89
Soda	11.54	11.52
Calcium Oxide	10.46	10.49
Magnesium Oxide	7.29	7.38
Ferric Oxide	0.59	0.60
Sodium Chloride	25.99	25.97
Silica	1.45	1.44
Sulphuric Acid	25.36	25.30
Phosphoric Acid	2.37	2.38
	<hr/> 99.96	<hr/> 99.92

Fucus Serratus.

	I.	II.
Potash	4.99	5.01
Soda	18.98	18.90
Calcium Oxide	14.75	14.79
Magnesium Oxide	10.39	10.38
Ferric Oxide	0.50	0.52
Sodium Chloride	23.96	23.94
Silica	1.50	1.52
Sulphuric Acid	20.89	20.90
Phosphoric Acid	3.93	3.92
	<hr/> 99.89	<hr/> 99.88

Thapsia Resin. F. Canzoneri. (*Gazz. Chim. Ital.*, xiii. 514-521.) The root of *Thapsia Garganica*, a plant known for its vesicating properties, yields to boiling alcohol a white, amorphous, waxy substance, slightly soluble in ether and carbon bisulphide, and melting, after purification, at 90°. This substance, however, forms but a small part of the thapsia root. More abundant and important constituents are obtained by treating the dried and chopped root in a percolator with ether, whereby a yellow solution is obtained, which, on distilling off the ether, yields an amber-coloured syrupy resin possessing strong vesicating properties. This acid dissolves in strong aqueous potash at ordinary temperatures and in dilute potash when heated,—in both cases with great rise of temperature,—and on neutralizing the resulting solution with hydrochloric acid, a yellow curdy precipitate is formed, having an unpleasant odour, and consisting of a mixture of liquid and solid ethers and fatty acids, together with resinous substances. From this mixture of products the author has obtained: (1) An octoic or caprylic acid, $C_8H_{16}O_2$. (2) A new acid of the series $C_nH_{2n-2}O_4$, which he designates as *thapsic acid*. (3) A non-azotised, neutral, vesicating substance.

A detailed description of these substances is given in the author's paper.

The Classification and Properties of Red Resins known under the name of Dragon's Blood. J. J. Dobbie and G. G. Henderson. (*Pharm. Journ.*, 3rd series, xiv. 361-365.) The authors' results are summed up in the following:—

There are at least four distinct kinds of red resin at present sold as dragon's blood, or labelled in collections under that name. One variety is brick-red in colour, melts at about 80° C., gives off red-coloured highly irritating fumes when decomposed by heat, dissolves readily with an orange-red colour in alcohol, ether, chloroform, carbon bisulphide, and benzene, is insoluble or only slightly soluble in cold caustic soda, ammonia, lime water, and sodium carbonate, and dissolves with difficulty when boiled in these reagents. Its alcoholic solution has an acid reaction, and gives a brown-red coloured precipitate when mixed with a solution of lead acetate. Its composition may be represented by the formula $C_{18}H_{18}O_4$. This is undoubtedly the resin of *Calamus Draco*, some of the specimens which were examined having their origin well authenticated.

A second variety is of a beautiful carmine-red colour, melts at about 100° C., gives off non-irritating fumes when decomposed by heat, dissolves freely with a pink colour in alcohol, ether, and

chloroform, but is insoluble in carbon bisulphide and benzene; dissolves readily in cold caustic soda, ammonia, and sodium carbonate, and much more readily than the foregoing in lime water. Its alcoholic solution has an acid reaction, and gives a lilac-coloured precipitate with lead acetate. Its composition may be represented by the formula $C_{17}H_{19}O_6$. The source of this resin is quite uncertain. The authors have no means of determining whether it is identical with any hitherto described variety of red resin. The specimens examined are marked as having come from the Dutch East Indies, but beyond this they know nothing of their origin.

A third variety is of a vermilion colour, melts at about $80^{\circ}C.$, gives off aromatic irritating fumes when decomposed by heat; dissolves with a blood-red colour in alcohol and ether, but is insoluble in chloroform, carbon bisulphide, and benzene; dissolves readily in cold caustic soda, ammonia, lime water, and sodium carbonate. Its alcoholic solution has an acid reaction, and gives with lead acetate a mauve-coloured precipitate. Its composition may be represented by the formula $C_{18}H_{18}O_4$. This is the resin from species of *Dracæna*. One of the specimens examined is from *Dracæna Cinnabari*, Socotra, and as it was gathered by Professor Balfour, there can be no doubt as to its origin. Another specimen is from *Dracæna Draco*, and its origin is also well authenticated. Some of the other specimens examined are marked *Calamus*, but there can be little doubt that this is a mistake, and that all the resins having the properties just enumerated, are derived from species of *Dracæna*. It seems certain then that the resin derived from *Dracæna sp.* is totally different in property from that derived from *Calamus sp.*

The fourth variety is a mixture, in varying proportions, of a reddish brown coloured resin, freely soluble in carbon bisulphide, and a light brick-red coloured resin, nearly insoluble in carbon bisulphide. The two portions also differ considerably as regards their solubility in ether, benzene, and other reagents, the dark portions being in all cases the less soluble of the two. Since, however, it dissolves to a slight extent in all reagents, the authors found it impossible to effect a complete separation of the two portions. The portion freely soluble in carbon bisulphide is probably identical with the resins of the first class, while the other portion seems to be a distinct resin.

Much discussion has taken place with regard to the presence of a volatile acid in dragon's blood. It seems certain that none of

the varieties of this resin contain benzoic acid; at all events the authors failed to obtain an extract from any of them with petroleum ether, in which benzoic acid is freely soluble. They tested for cinnamic acid by sublimation, and found it present in the resins of the first and third classes, but not in those of the second and fourth classes. To ascertain the delicacy of this method, the authors made a preliminary experiment with artificial mixtures containing 1 per cent. of cinnamic acid, and found that the acid could be separated out by sublimation from very small quantities of such a mixture. Probably the error as to the presence of benzoic acid arose through confounding it with cinnamic acid, or possibly from working with a resin in which benzoic acid had been formed by partial oxidation.

Several valuable investigations upon the decomposition products yielded by dragon's blood, when subjected to destructive distillation and to the action of various oxidizing agents, have been conducted by Hlasiwetz and Barth, and others. Though probably the different kinds of resin will be found to yield nearly the same products, it is unfortunate that the characters of the different varieties had not been established before these investigations were undertaken, as it must be uncertain, unless each specimen was examined separately, whether or not the experimenters always had the same variety in hand.

Pseudo-Gutta Perchas, or Substances Supplementary to Gutta Percha. (From *The Indian Agriculturist*; *Pharm. Journ.*, 3rd series, xiv. 104.) Foremost amongst pseudo-guttas, as we use the phrase, stands balata gum. It is obtained from the *Mimusops Balata* of Gærtner (nat. ord. *Sapotaceæ*), and is synonymous with the *Sapota Mulleri* of Bleekrod, the *Achras Balata* of Aublet, etc. It is found in Demerara, Berbice, British and French Guiana, Antilles, Jamaica, and Surinam. It has many vernacular names, amongst which may be mentioned, balata, paardenvleesch (Dutch horse-flesh), bullet-tree, etc.

The "balata" gum is of a character somewhat between caontchouc and gutta percha, combining in some degree the elasticity of the one with the ductility of the other, freely softening and becoming plastic and easily moulded, liked gutta percha. What small parcels arrived in England met with a ready sale and were remarkably free from adulteration. But, through the difficulty of collection, the supply of this excellent article has fallen off. It is collected by making incisions in the bark about seven feet from the ground, and a ring of clay placed round the tree to catch the milk

as it exudes. The yield is said to be in profusion, especially at the time of the full moon, and the operation can be repeated every two months in the rainy season. It takes six hours to bring about coalescence by simple atmospheric influence, but very quickly by boiling in water. A large tree is said to yield as much as 45 lbs. of "dry gum." The tree in every way is well worthy of a trial by acclimatizing it.

In India there are several plants whose products may be classed as pseudo-guttas. First and foremost of these we have the pauchontee, or India gutta-tree, the *Bassia elliptica* of Dalzell, the *Isonandra acuminata* of Lindley, but now known as *Dichopsis elliptica*. It is found in the Wynaad, Coorg, Anamallay and Neilgherry Hills, Sholah Forest, Cochin, Sicchar, and, according to General Cullen, "appears to be common in all the forest tracts at all within the influences of the south-west rains." This tree, which is now placed in the same genus as the true gutta percha, is a large one—from eighty to one hundred feet high—and was first met with by Dalzell, in North Canara, near the falls of Goirsuppah, in 1849. Since that date, General Cullen and Dr. Cleghorn have used every exertion to bring the substance prominently forward, but without success. The gum is obtained by tapping, 1½lb being obtained from one tree by five or six incisions, a large tree yielding as much as 20 to 40lbs. of sap. Many experiments have been made with specimens of the raw milk, i.e., milk simply dried by exposure to the atmosphere. The results of these experiments have shown that for telegraphic purposes it is wanting in some essential qualities, but it has been recommended as a sub-aqueous cement or glue. When dissolved in ordinary gutta percha solvents, after the evaporation of the solvent, it remains some time soft and viscid, and partakes somewhat of the character of bird-lime. When cold, it is hard and brittle.

There are in India other nearly allied *Sapotaceæ* which deserve attention, in order to ascertain whether any of them yield a milky juice likely to be of commercial use. Amongst the *Euphorbiaceæ* there are two plants worthy of notice. The *Euphorbia Cattimandoo*, found in various parts of India, was first brought to notice by the Honourable W. Elliot, and a prize medal was awarded for this substance by the jurors of the 1851 exhibition. This spiny euphorb grows to the size of a shrub or small tree, and the milk flows out freely when a branch is cut. The natives use it as a cement to fasten knives in handles, etc. Under the influence of heat it becomes soft and viscid, and when dry very brittle. The *Euphorbia*

Tirucalli, the milk-hedge or Indian tree-spurge, is a succulent unarmed plant, attaining a height of 20 feet, and its inspissated milk is used for various—chiefly medicinal—purposes, and has been recommended as a gutta-percha substitute; but, like *Euphorbium*, it has a very acrid character, and the collection is a very dangerous operation to the eyes.

The Testing of Peruvian Balsam. C. Grote. (*Pharmaceut. Centralhalle*, xxiv. 179.) Döschner's method of ascertaining the purity of Peruvian balsam, which has been introduced into the German Pharmacopœia as the official test, has been repeatedly called in question as liable to give indications of impurity in genuine samples of the balsam. Until this controversy is settled, the author suggests that Flückiger's lime test should be employed, which, though less delicate, certainly reveals any notable adulteration with common resin, storax, benzoin, and tolu. In order to detect these impurities by means of this test, ten drops of the balsam to be tested should be mixed with one or two drops of alcohol, before the 0.4 gram of slaked lime is introduced, as in this way only the characteristic solidification occurs if the sample be adulterated by fusion with any of the substances named.

The Testing of Copaiba. H. Hager. (*Pharmaceut. Centralhalle*, xxiv. 141.) Two volumes of the sample to be tested are vigorously shaken for about two minutes with two volumes of ether and three volumes of ammonia liquor of ordinary strength. Genuine copaiba thus yields a cloudy mixture without froth, or at any rate with but a slight froth, which disappears on allowing the mixture to stand for five minutes. In the presence of colophony, turpentine, or other added resins, a froth is produced which lasts for about half an hour.

Phellandrium Aquaticum. L. Pesci. (*Gazz. Chim. Ital.*, xiii. 496.) This plant yields an essential oil, about 80 per cent. of which consists of a terpene (*Phellanthrene*) boiling at 103–104° under a pressure of 80 mm., and at 171–172° under 766 mm. Sp. gr. 0.8558 at 10°. Refractive index for $D=1.481$. Rotatory power $[\alpha]_D = -16.74$. The author has not succeeded in obtaining pure hydrochlorides. *Phellanthrene* heated at 140–150° in sealed tubes is converted into a transparent, neutral solid substance, soluble in ether, insoluble in alcohol, melting at 86°, isomeric with the liquid, but differing from it in having a strong dextrorotatory power.

The Volatile Oil of Birch (*Betula Lenta*). H. P. Pettigrew. (*Amer. Journ. Pharm.*, 1883, 385.) The author's investigation of this oil leads to the following conclusions :—

The volatile oil of birch is not identical with the oil of gaultheria, in that it consists entirely of salicylate of methyl, and contains no terpene.

The specific gravity of oil of gaultheria is not 1·180, as stated in the United States Pharmacopœia, but 1·0318; the former being the specific gravity of oil of birch, which, as is known, is often indiscriminately sold and employed as oil of gaultheria.

Hedge-Mustard Oil. E. Valenta. (From *Journ. Soc. Chem. Ind.*) To obtain a substitute for rape-seed oil there has been an oil manufactured of late years from the so-called hedge-mustard or bank-cresses,—*Raphanus raphanistrum*, or *Raphanistrum arvense*, a plant which is now cultivated in Hungary. This oil is brought to the market either by itself or mixed with rape-seed oil, and under the latter name.

The siliquous fruit of the plant mentioned bears little seeds, which contain 30 to 35 per cent. of oil. This can be for the most part obtained by pressing. It has a dark olive-green colour, and an odour and taste very similar to rape-seed oil; its density and faculty for saponifying with alkali is also nearly the same; so that it is difficult to recognise it in a mixture of the two oils. The author, who has made this point the object of a special examination, has tested the two oils as regards their behaviour to the usual reagents.

On acting upon them with acids of different strengths, such as sulphuric and nitric acids, a mixture of these, aqua-regia, phosphoric acid, etc., as well as with oxidizing mixtures, as potassium bichromate and sulphuric acid, or concentrated nitric acid saturated with nitric oxide, various colours are produced with both oils, by the shade and intensity of which they can be pretty well distinguished.

The author gives a list of these reactions. Most characteristic for hedge-mustard oil appears the following reaction:—About 5 grams of this oil are saponified with potassium hydrate and spirit with warming, and the soap thus obtained is filtered from the unchanged oil, which is golden yellow and almost odourless and tasteless. The concentrated filtrate, on adding hydrochloric acid to strongly acid reaction, assumes a distinct green colour if a somewhat large portion of hedge-mustard oil be present.

Note on a Case of Sophistication of American Oil of Turpentine. B. Redwood. (*Pharm. Journ.*, 3rd series, xiv. 625.) The odour of the sample was peculiar, and the specific gravity very high (·887). The flashing point (Abel petroleum test) was also somewhat high (96° F.). The flashing point of eleven other samples of

oil of turpentine, presumably pure, imported about the same time from the United States, was 92° F., and the highest specific gravity 0.8676. Upon distillation in a current of steam the sample yielded 4 per cent. of a viscid residue, slightly heavier than water. The specific gravity of the distillate was 0.873. The residue, besides being some sixteen times greater in quantity, differed in physical characters from the residues similarly yielded by the eleven other samples just referred to. The residues obtained ranged from 0.12 per cent. to 0.35 per cent. A distinctive feature of this oil is its persistently bitter taste. The author has not succeeded in identifying the oil.

The Essential Oils of *Blumea Lacera*, D. C., and *Sphæranthus Indicus*, Linn. W. Dymock. (*Pharm. Journ.*, 3rd series, xiv. 985.) These two plants attract attention in India during the cold weather by their abundance on waste ground and in fields after the harvesting of the wheat crop. The *Blumea* has a powerful camphoraceous odour, and *Sphæranthus indicus* a rose-like perfume.

B. lacera is a perennial plant, with obovate, deeply serrated leaves and yellow groundsel-like flowers, the whole plant being thickly clothed with long silky hairs. The natives of the Concan, near Bombay, call it *nimúrdi*, and make use of it to drive away fleas and other insects. One hundred and fifty pounds of the fresh herb in flower was submitted to distillation in the usual manner with water, and yielded about 2 ounces of a light yellow essential oil, having a specific gravity of 0.9144 at 80° F., and an extraordinary rotating power, 100 mm. turning the ray 66° to the left. D. S. Kemp, who made the observation, checked it by examining a 10 per cent. solution in alcohol, which gave 6.6 .

This *Blumea* is of interest as the possible source of an insect powder.

Sphæranthus indicus is an annual with sessile, decurrent, obovate, bristly serrate, downy, glutinous leaves, and globular heads of purple flowers. It is a well-known Indian medicine, under the names of *múndi*, *gorakhmúndi*, *munditika*, *murmuria*, and *kottak-karandai*, and is reputed to be a general tonic, deobstruent, alterative and aphrodisiac. The distilled water is recommended for use, and also the root. One hundred and fifty pounds of the fresh herb was distilled with water in the usual manner, and yielded a very deep sherry coloured, viscid essential oil, very soluble in water, and clinging to the side of the vessel, so that only half an ounce could be collected. The oil does not appear to have any rotatory power, but it is difficult to examine on account of its opacity.

Oil of Gaultheria. T. E. Leonard. (*Amer. Journ. Pharm.*, May, 1884.) Oil of wintergreen was first made in Luzerne county, Pa., in 1863, from which time it has been distilled in great quantities, with the exception of last year, when the yield was not so plentiful, owing to the destruction of the shrubberies by the fire which passed over the mountains.

In distilling, the entire overground portion of the plant is employed, which has its greatest yield during the months of July and August.

The still is generally a wooden box, about eight feet long, four feet wide, four feet high, with a copper bottom, and stayed with bolts. The head of the still is copper, and connecting with this is a square or circular worm of the same material or of tin, placed in a barrel. The still being filled with wintergreen to within about twelve inches of the top, a sufficient quantity of water is added, and this is allowed to macerate from ten to twelve hours. The fire being started, the distillation commences and continues for about eight hours; but during the first two or three hours, 90 per cent. of the oil has passed over. For collecting the distillate, most of the distillers use a wide mouth bottle or fruit jar, fitted with a large cork having two holes. A small tin or glass funnel is put into one of the holes, so that the beak of the funnel is below the shoulder of the receiving vessel, and connected with the other hole is a suitable pipe forming an egress. The distillate passes into the receiving vessel through the funnel. It is here that the oil and the water separate, the oil going to the bottom, and the water being lighter and in excess passes through the egress pipe into a larger receptacle, where it is reserved for a subsequent operation (cohobation).

Occasionally the oil is very highly coloured. The author has found several samples to contain traces of iron, which is due to the oxidation of the tin worm or can with which the oil comes in contact. Tin worms are used on account of their cheapness, but will only last about two weeks, before they undergo oxidation.

The wholesale dealers have three ways of "cleaning" it, redistillation, filtration, and decolorization. The oil to be decolorized is put into a bottle and crystals of citric acid are added, the whole allowed to stand, agitating occasionally, until the oil is colourless, or nearly so.

Matico-Camphor. K. Kügler. (*Ber. der deutsch. chem. Ges.*, xvii. 2841.) The leaves of *Piper angustifolium*—matico leaves—yield about 2·7 per cent. of an ethereal oil, which is dextrorotatory, and the greater part of which distils over at 200°. The residue on

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cooling deposits crystals of matico camphor which melt at 103° (Flückiger). The author has recently investigated this substance. He found that the crude camphor melts between 83° and 103° , and after several recrystallizations at 94° . The purified product is readily soluble in alcohol, ether, chloroform, benzene, and petroleum spirit, and is free from the strong odour and camphorous taste which the crude oil possesses. On treatment with hydrochloric acid it assumes a violet colour, which rapidly changes to blue, finally to green. On analysis numbers corresponding with the formula $C_{19}H_{20}O$ were obtained. The author is of opinion that further researches into the properties of matico-camphor will lead to interesting results. It may prove to be the ethyl derivative of ordinary camphor, $C_{10}H_{16}(C_2H_5)O$.

Patchouli Camphor. H. C. C. Maisch. (*Amer. Journ. Pharm.*, February, 1884.) Patchouli camphor, a homologue of borneol, as obtained from the oil, was in pieces of various size and form, mostly belonging to the hexagonal class of crystals. The colour ranged from light yellow, probably from adhering or enclosed oil, to colourless.

In order to purify the camphor, it was dissolved in alcohol. This solution did not crystallize, although evaporated to a syrupy consistency. The alcohol was completely driven off, and the residue dissolved in ether, from which solution it deposited after several times recrystallizing in colourless, truncated, hexagonal, prismatic crystals.

The fusing points of both the crude and the recrystallized camphor were determined. A small quantity was put on some mercury in a beaker glass in which a thermometer was suspended, the mercury covering the bulb. A slow heat was then applied, the mercury in the thermometer rising slowly. The melting point of the recrystallized camphor was found to be between 55° and $56^{\circ}C.$, coming near that determined by Gal in 1869 (*Comptes Rendus*, lxxviii. 406), who gives it as $54-55^{\circ}C.$, while another author, De Montgolfier (*Ber. der deutsch. chem. Ges.*, 1877, 374), gives it as $59^{\circ}C.$ The melting point of the crude camphor determined upon mercury, as stated above, was found to be between $57-58^{\circ}C.$, or about $2^{\circ}C.$ higher than that of recrystallized. The latter again solidified when cooled to between 48° and $49^{\circ}C.$, but the congealing point for the crude camphor is between 54° and $55^{\circ}C.$ The boiling point determined by Gal is given at $296^{\circ}C.$, the specific gravity as 1.051 at $4.5^{\circ}C.$, and the vapour density as 8.00 at $324^{\circ}C.$

Manufacture of Camphor in Japan. (*St. Louis Druggist*, August,

1883.) Consul Jones, of Nagasaki, supplies a report on this subject from which we abstract the following :—

In the manufacture of camphor the tree is necessarily destroyed, but, by a stringent law of the land, another is planted in its stead. The simple method of manufacture employed by the natives is as follows :—

The tree is felled to the earth and cut into small pieces, or, more properly speaking, into chips.

A large metal pot is partially filled with water and placed over a slow fire. A wooden tub is fitted to the top of the pot, and the chips of camphor wood are placed in this. The bottom of the tub is perforated, so as to permit the steam to pass up among the chips.

A steam-tight cover is fitted on the tub. From this tub a bamboo pipe leads to another tub, through which the enclosed steam, the generated camphor, and oil flow. This second tub is connected in like manner with a third.

The third tub is divided into two compartments, one above the other, the division being perforated with small holes, to allow the water and oil to pass to the lower compartment. The upper compartment is supplied with a layer of straw, which catches and holds the camphor in crystal in deposit as it passes to the cooling process. The camphor is then separated from the straw, packed in wooden tubs of 133½ pounds each, and is ready for market.

After each boiling the water runs off through a faucet, leaving the oil, which is used by the natives for illuminating and other purposes.

Japanese Camphor and Camphor Oil. H. Oishi. (*Journ. Soc. Chem. Ind.*, 1884, 353.) *Laurus Camphora*, or kusunoki, as it is called in Japan, grows mainly in those provinces in the islands Shikoku and Kinshin which have the southern sea coast. It also grows abundantly in the province of Kishu.

The amount of camphor varies according to the age of the tree. That of a hundred years old is tolerably rich in camphor. In order to extract the camphor, such a tree is selected; the trunk and large stems are cut into small pieces, and subjected to distillation with steam.

An iron boiler of 3 ft. in diameter is placed over a small furnace. The boiler is provided with an iron flange at the top. Over this flange a wooden tub is placed, which is somewhat narrowed at the top, being 1 ft. 6 in. in the upper, and 2 ft. 10 in. in the lower diameter, and 4 ft. in height. The tub has a false bottom for the passage of steam from the boiler beneath. The

upper part of the tub is connected with a condensing apparatus by means of a wooden or bamboo pipe. The condenser is a flat rectangular wooden vessel which is surrounded with another one containing cold water. Over this is placed still another trough of the same dimensions, into which water is supplied to cool the vessel at the top. After the trough has been filled with water, the latter flows into the outer condenser by means of a small pipe attached to it. In order to expose a large surface to the vapours, the inner condensing trough is fitted internally with a number of vertical partitions, which are open at alternate ends, so that the vapours may travel along the partitions in the trough from one end to the other. The boiler is filled with water, and 120 kilograms of chopped pieces of the wood are introduced into the tub, which is then closed with a cover, cemented with clay, so as to make it air-tight. Firing is then begun; the steam passes into the tub, and thus carries the vapours of camphor and oil in the condenser, in which the camphor solidifies, and is mixed with the oil and condensed water. After twenty-four hours the charge is taken out from the tub, and new pieces of the wood are introduced, and distillation is conducted as before. The water in the boiler must be supplied from time to time. The exhausted wood is dried and used as fuel. The camphor and oil accumulated in the trough are taken out in five or ten days, and they are separated from each other by filtration. The yield of the camphor and oil varies greatly in different seasons. Thus much more solid camphor is obtained in winter than in summer, while the reverse is the case with the oil. In summer, from 120 kg. of the wood, 2.4 kg., or 2% of the solid camphor are obtained in one day; whilst in winter, from the same amount of the wood, 3 kg., or 2.5% of camphor are obtainable in the same time.

The amount of the oil obtained in ten days, i.e., from 10 charges or 1,200 kg. of the wood in summer is about 18 litres, while in winter it amounts only 5-7 litres. The price of the solid camphor is at present about 1s. 1d. per kilo.

The oil contains a considerable amount of camphor in solution, which is separated by a simple distillation and cooling. By this means about 20% of the camphor can be obtained from the oil. The author subjected the original oil to fractional distillation, and examined different fractions separately. That part of the oil which distilled between 180-185° C., was analysed after repeated distillations. The following is the result:—

Found.	Calculated as C ₁₀ H ₁₆ O.
C = 78·87	78·95
H = 10·73	10·52
O = 10·40 (by difference)	10·52

The composition thus nearly agrees with that of the ordinary camphor.

The fraction between 178–180° C., after three distillations, gave the following analytical result:—

$$\begin{array}{r} \text{C} = 86\cdot95 \\ \text{H} = 12\cdot28 \\ \hline 99\cdot23 \end{array}$$

It appears from this result that the body is a hydrocarbon. The vapour density was then determined by V. Meyer's apparatus, and was found to be 5·7 (air=1). The molecular weight of the compound is therefore $5\cdot7 + 14\cdot42 \times 2 = 164\cdot4$, which gives

$$\begin{aligned} \text{H} &= \frac{164\cdot4 \times 12\cdot28}{100} = 20\cdot18 \\ &\text{or C}_{13}\text{H}_{20} \\ \text{C} &= \frac{164\cdot4 \times 86\cdot95}{100} = 11\cdot81 \end{aligned}$$

Hence it is a hydrocarbon of the terpene-series, having the general formula C_nH_{2n-4}. From the above experiments, it seems to be probable that the camphor oil is a complicated mixture, consisting of hydrocarbons of terpene-series, oxyhydrocarbons isomeric with camphor, and other oxidized hydrocarbons.

Application of the Camphor Oil.—The distinguishing property of the camphor oil, that it dissolves many resins and mixes with drying oils, finds its application for the preparation of varnish. The author has succeeded in preparing various varnishes with the camphor oil mixed with different resins and oils. Lampblack was also prepared by the author, by subjecting the camphor oil to incomplete combustion. In this way, from 100 c.c. of the oil about 13 grams of soot of a good quality were obtained. Soot or lampblack is a very important material in Japan for making inks, paints, etc. If the manufacture of lampblack from the cheap camphor oil is conducted on a large scale, it would no doubt be profitable. The following is the report on the amount of the annual production of camphor in the province of Tosa up to 1880:—

		Amount of Camphor produced.		Total Cost.
1877	.	504,000 kins.	.	65,520 yen.
1878	.	519,000 "	.	72,660 "
1879	.	292,890 "	.	74,481 "
1880	.	192,837 "	.	58,302 "

(1 yen = 2s. 9d.; 1 kin = 1½ lb.)

A Method of Freeing Essential Oil of Bitter Almonds from Prussic Acid. R. Eck. (*Pharm. Zeitung*, January 16, 1884.) Ten parts of crude oil are mixed with 6 parts of slaked lime and 3 parts of ferrous sulphate, and a very powerful jet of steam, at a temperature of 140° C., passed into the mixture.

The operation should be carried out as quickly as possible, to reduce the products of decomposition to a minimum, for which reason the steam must be under pressure.

Detection of Alcohol in Essential Oils. T. Salzer. (*American Drugg.*, 1884, 94, from *Pharmaceut. Zeitung*.) The author reviews the methods heretofore proposed for detecting alcohol in essential oils, and finds that a combination of the distillation and the fuchsin process is the most sensitive. He proceeds as follows:—

A little of the essential oil is poured into a dry test-tube, taking care not to wet it in its upper portion, and a few fragments of fuchsin are then sprinkled upon the middle and upper inside surface of the test-tube. On heating, no change will be observed, if alcohol was absent. But if the oil contained even as little as one-tenth per cent. of alcohol, the ascending vapour of the latter will cause each particle of fuchsin to be surrounded by a red stain, either at once or after setting the test-tube aside for a short time. It is easy to recognise by this test the presence of one milligram of alcohol in one gram of the oil.

The author, in quoting this test, applies it specifically to oil of lemon, and attaches the remark that the method will undoubtedly be applicable to other essential oils, or to the detection of alcohol in other liquids which do not of themselves exert any solvent action upon fuchsin.

Adulteration of the Oil of *Matricaria Chamomilla*. Dr. Weppen. (*Zeitschr. des oesterr. Apoth. Ver.*, 1884, 116.) The author calls attention to the probability of an extensive adulteration of this oil with the oil of *Achillea Millefolium*, and states that chemistry affords no means, at the present time, of detecting such an adulteration.

Essential Oils and Perfumes. L. Naudin. (*Moniteur Scientifique*; *Pharm. Journ.*, 3rd series, xiv. 44.) This communication

has for its principal object the description of a new mode of extraction of essences and perfumes by volatile solvents with the aid of a vacuum and cold. It is illustrated by a woodcut of the apparatus employed. Reference should be made to the sources quoted, as the paper does not admit of useful abstraction.

The Purgative and Vesicating Principles of Croton Oil. H. Senier. (From papers read before the Pharmaceutical Society, December 5, 1883, and printed in the *Pharm. Journ.*, 3rd series, xiv. 446, 447.) When alcohol (sp. gr. 794-800) is mixed in equal volumes with English pressed croton oil, perfect solution takes place, the mixture being permanent at all ordinary temperatures, and this is equally true when any less quantity of alcohol is used. When, however, the proportion of alcohol to croton oil becomes as seven volumes to six, or any larger proportion of alcohol, then a part of the croton oil separates. This part varies in quantity in the case of different samples of oil. That portion of the croton oil which separates when the alcohol is in excess is afterwards insoluble in any proportion of alcohol. But that portion of the oil dissolved by alcohol is, when separated, soluble in all proportions.

The author has shown in a previous paper that the part of croton oil soluble in alcohol contains the vesicating principle, while the portion insoluble in alcohol is entirely non-vesicating. He now shows that the purgative properties of croton oil reside entirely in this insoluble, non-vesicating part, and that this portion of the oil is likely to become a valuable medicinal agent. He has also endeavoured to ascertain to what constituent of the soluble portion of the oil the vesicating properties are due, and has traced these properties to the non-volatile fatty acids, chiefly to those which have the lowest melting points, are least readily saponified by alkalies, and are first liberated when the alkali soap is decomposed by acids. He attributes the purgative action not to the free acids, but to the combination in which they exist in the oil. His experiments towards the isolation of the new acid possessing the purgative properties are still in progress; at present he believes that it will be found to be closely allied to oleic acid and its analogues, ricinoleic and linoleic acids.

The Composition of Cocoa-Butter. M. C. Traube. (*Archiv der Pharm.* [3], xxi. 19-23.) The author has been unable to confirm Kingzett's observation of the presence of two new fatty acids in cocoa-butter, and maintains that the physical properties of this fat are due to the relative proportions of oleic, lauric, palmitic, stearic, and arachic acids contained in it.

Vegetable Tallow from Singapore. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xiv. 401.) The author reports upon a specimen of this substance recently presented to the Pharmaceutical Society's Museum by Mr. R. Jamie, of Singapore, and recommended to his notice by the latter on account of its non-liability to become rancid.

At the ordinary temperature this tallow is a white friable solid, softening into a pasty condition when rubbed between the fingers, and ultimately melting sufficiently to be rubbed in without leaving the hand very greasy. It has a very slight nutty odour and taste. It would seem therefore to be peculiarly suitable for camphor balls, suppositories and pessaries; for the latter its slowness in melting seems to peculiarly fit it.

At the author's request, this substance has been made the subject of some preliminary experiments by E. Fielding, who reports as follows:—

At 65° F. it remains a little solid; between 82° and 104° F. it has the consistence of flour paste; it fuses at about 118° F., but remains transparent and liquid at 112° F. It is soluble in about an equal weight of cold ether; it is sparingly soluble in cold acetic ether and acetone, but very soluble in these liquids when heated, the greater part being precipitated on cooling; it dissolves in half its weight of cold chloroform, but mixes with one third of its weight of the same liquid when heated. In bisulphide of carbon, either cold or hot, it is extremely soluble. In cold benzene it is soluble to the extent of about 1 in 4. In hot benzene and petroleum spirit (hexane or heptane) it dissolves in all proportions, but the solution gelatinizes on cooling. It is very soluble in cold turpentine, and dissolves in it when heated in all proportions. In alcohol it is soluble to the extent of about 1 in 30 when cold, or 1 in 20 when hot, and in isopropyl alcohol it dissolves to the extent of about 1 part in 25 when cold, and 1 in 4 when hot.

According to a cutting from the *Java Bode* newspaper, sent by Mr. Jamie, the vegetable tallow, known as Minyak Tangkawang, or Minyak Sangkawang, is obtained from the seeds of one or more trees of the genus *Hopea*, found in the S. and E. division of Borneo, chiefly in the neighbourhood of Qualla Kapuas, and on the west coast in the districts of Sambas and Mampawa. The Dyaks call the fat Kakawang, and the tree which yields it Upu Kakawang. This tree is one of the giants of the forest. Several species of the genus appear to be used. Of these *Hopea splendida*, the Tongkawang Tonggul, is also called by the natives Dammar Tangkawang (because the bark yields a dammar?). The timber is used

by the Dyaks for making their prahus, as it is proof against the influence of water. The bark also yields a red dye. This tree grows on alluvial fat clayey ground on the banks of great rivers. *Hopea aspera* grows on the higher mountain tracts, principally on the declivities of Mampawa, and is distinguished by the hairiness of the stems.

The preparation of the fat is very simple. When the ripe fruit falls on the ground, it is collected and allowed to germinate a little in a moist place. It is then dried in the sun until it becomes brittle. The fruit is then deprived of its shell and put into a rattan or bamboo basket suspended over boiling water. When it has been well steamed, the fruit becomes soft and plastic, like dough. The fat is then expressed by squeezing the doughy mass in a cloth, and is poured into joints of bamboos, by which it receives the cylindrical form in which it is met with in commerce. Some Dyak tribes press the fruit by means of two beams. But it is probable that by neither of these processes is all the fat obtained.

The trees begin to yield when they are about eight or ten years old, and the crops are somewhat irregular, but every four or five years an extraordinarily large crop may be counted upon, the fruit being ripe in December and January. According to 'Spon's Encyclopædia' (p. 1413), about ten species of *Hopea*, yielding oil seeds differing much in size, are recognised by the natives of Borneo, three of these being common in Sarawak. The fat is also prepared in Java and Sumatra. By the natives the tallow is used for culinary and lighting purposes.

For some time this article has been in great favour as a lubricating agent. In the author's opinion it deserves to be better investigated with regard to its fitness for medical and pharmaceutical uses.

Adulteration of Almond Oil. (*Analyst*, 1884, 82.) Almond oil, like other oils, is often adulterated. It is mixed with the oil which is obtained from peach, apricot, and plum kernels; and even with gingerly oil, etc. Very careful researches bearing on these adulterations have been made by Herr Bieber, of Hamburg, who has amongst other details given the following indications for detecting falsifications:—Prepare a reagent by mixing equal parts by weight of concentrated sulphuric acid, nitric acid, and water, and allow the whole to cool. By mixing five parts of the suspected sample with one part of this acid mixture, if the oil be pure there is formed a liniment of a pale yellow colour; in the peach-kernel oil the liniment will first be red, and will then turn to a dark orange

shade; with gingerly oil the colour will first be a yellowish red, and will then pass to a dirty orange-red; with poppy or nut oil, the liniment will be whiter than with almond oil. By mixing almond oil with nitric acid, of specific gravity 1.40, there is formed a liniment of a pale yellow colour; with peach-kernel oil the liniment will be red; with gingerly oil it will be of a dirty yellowish green, which in time becomes red. A mixture to the extent of 5 per cent. of peach-kernel or gingerly oil can thus be perfectly traced in almond oil. By preparing various mixtures of almond oil with peach-kernel, and by allowing the acid liquid to act upon these mixtures, a graduated scale is established for recognising approximately the quantity of foreign oil added to the almond oil.

The Testing of Olive Oil. O. Bach. (*Amer. Journ. Pharm.*, 1883, 354.) For the purpose of a general acquaintance with a fixed oil, the so-called elaidin test is first applied, and with this is connected the test with nitric acid. The oil to be tested (about 5 c.c.) is actively shaken in a test-tube for one minute with an equal volume of nitric acid, sp. gr. 1.30, when after this time the oil will have assumed the following colour: olive oil, pale green; cotton-seed oil, yellowish brown; sesame oil, white; sunflower oil, dirty white; ground-nut oil, rape-seed oil and ricinus oil, a pale rose colour. Immediately after the observation of the colour, the test-tube is placed in a water-bath containing water in active ebullition, and allowed to repose therein for five minutes. It is hereby shown that the action of the nitric acid is most violent upon the cotton-seed oil and sesame oil, occasionally so violent as to cause the oil to be thrown out of the glass. After the expiration of five minutes, and after the test-tube has been taken out of the water-bath, the following colours are shown: olive oil and rape-seed oil, orange-yellow; ricinus oil, golden yellow; sunflower oil, reddish yellow; sesame and ground-nut oils, brownish yellow; cotton-seed oil, reddish brown.

After standing for twelve to eighteen hours at about 15° C., olive oil, rape-seed oil, and ground-nut oil will have firmly solidified, ricinus oil and cotton-seed oil become salve-like (smeary), whilst sesame oil remains perfectly liquid.

Mixtures of olive oil with small amounts of cotton-seed oil and sesame oil are characterized by the fact that at first the entire mass, although more darkly coloured, solidifies like pure olive oil, but after from twenty-four to thirty-six hours a brown oil separates upon the surface of the firmly solidified mass, whilst the lower layer now shows the yellow colour of the pure olive oil. The presence

of oil of rosemary, as such, usually occurs in the sophisticated oils, exercises no influence by agitation with cold nitric acid, but after heating it imparts to the oil a slightly darker colour. Oils which have been treated with alkalies show the same behaviour as pure oils.

For the determination of the melting point of the fatty acids, 10 grams of the oil are saponified on a water-bath with 5 grams of potassium hydrate and the addition of a little water and alcohol. After the complete dissipation of the alcohol, the remaining soap is dissolved in hot water, and from the clear solution the fatty acids are separated by the addition of hydrochloric acid. When the fatty acids after continued heating float upon the saline solution as a perfectly clear oil, a portion of the oily layer is brought into a small, narrow, thin-walled test-tube, and allowed to solidify therein. The determination of the melting or solidifying point is effected by placing the small test-tube containing the fatty mass in a beaker filled with water, which is warmed by means of a small flame; and by the aid of a thermometer, dipped in the fatty acids and gently moved to and fro during the observation, the point is precisely observed when the entire mass becomes perfectly clear, and that when clouds begin to form about the bulb containing the mercury. It is now shown that the acids derived from pure olive oil, without restriction as to the origin of the latter, melt between 26.5 and 28.5° C., and solidify not lower than 22° C. The oils applied for the adulteration of olive-oil, show, with relation to the melting point of their fatty acids, very considerable deviations from the former. The melting and solidifying points, respectively, of the acids of cotton-seed oil, sesame oil, and ground-nut oil are considerably higher,—those of sunflower oil, rape-seed oil, and ricinus oil considerably lower,—than those of the acids of olive oil.

The Fatty Acids of	Melt at	Solidify at
Cotton-seed Oil . . .	38.0° C.	35.0° C.
Sesame Oil	35.0	32.5
Ground-nut Oil . . .	33.0	31.0
Sunflower Oil . . .	23.0	17.0
Rape-seed Oil	20.7	15.0
Ricinus Oil	13.0	2.0

The above figures deviate so far from the data obtained with pure olive oil, that by the determination of the melting point adulterations to such an extent as occur in commerce may very readily

be detected; for a Gallipoli olive oil, mixed with 20 per cent. of sunflower oil, melts already at 24° C., and solidifies first at 18° C. A Nizza oil, mixed with 20 per cent. of cotton-seed oil, melts first at 31.5° C., and solidifies already at 28° C. A Gallipoli oil, mixed with $33\frac{1}{2}$ per cent. of rape-seed oil, melts already at 23.5° C., and solidifies first at 16.5° C.; mixed with 50 per cent. of rape-seed oil, it melts already at 20° C., and solidifies first at 13.5° C., etc.

For testing the solubility of the fatty acids in alcohol-acetic acid, the method proposed by David for the estimation of stearic acid is applied.

The principle of this method is based on the fact that when acetic acid is added by drops to an alcoholic solution of oleic acid, a moment occurs when the oleic acid becomes perfectly separated, but that stearic acid, which is insoluble in a mixture of alcohol and acetic acid, also remains insoluble when the mixture contains oleic acid. In order, therefore, to apply the stated method for the testing of olive oil, the following manipulations are to be performed: equal parts of glacial acetic acid and water are mixed together in a flask; furthermore, into a small tube, divided into $\frac{1}{10}$ c.c. are brought 1 c.c. pure oleic acid, 3 c.c. of alcohol of 95 per cent., and 2 c.c. of acetic acid. Hereby nothing should be separated; but if an additional $\frac{1}{10}$ c.c. of acetic acid is added a turbidity begins to occur, and when there floats upon the mixture of alcohol and acetic acid 1 c.c. of oleic acid (or at first more), the liquid is ready for application. If this is not the case, the proportions are varied until the object is attained, that by the addition of $\frac{1}{10}$ c.c. acetic acid, a complete separation takes place. If this is attained, alcohol and acetic acid are then mixed in the proportions indicated by this preliminary experiment, e.g. 300 of alcohol and 225 of acetic acid. To the alcohol-acetic acid from 1 to 2 grams of stearic acid are then added, and the supernatant clear solution employed for the experiment. Of the oil (acids) to be tested, 1 c.c. is first placed in the tube, 15 c.c. of alcohol-acetic acid added, the mixture actively agitated, and the whole allowed to repose at a temperature of 15° C. If the olive oil is pure, it dissolves to a perfectly clear liquid, and the solution also retains this character. Cotton-seed oil is insoluble, and the solution obtained by gently warming solidifies at 15° C. to a white jelly. Sesame oil and ground-nut oil show a similar behaviour. Sunflower oil dissolves, but separates, at 15° C., a granular precipitate. Rape-seed oil is perfectly insoluble, and floats as an oily layer upon the surface. Ricinus oil, on the contrary, is soluble to a clear liquid, precisely

like olive oil, and can therefore not be detected in olive oil by this method. For the recognition of ricinus oil, beside the direct testing of the oil with alcohol, the determination of the melting point of the acids is of service. Olive oil with 25 per cent. of cotton seed-oil separates a granular deposit.

Analysis of Beeswax. O. Hohner. (*Dingl. polyt. Journ.*, ccli. 168. From *Journ. Chem. Soc.*) The author dissolves 3 to 5 grams of beeswax in about 50 c.c. of methyl alcohol, and titrates the cerotic acid with phenolphthalein and a solution of alcoholic potash, 1 c.c. corresponding with 0.3–0.4 c.c. of normal sulphuric acid. Having added potash in excess, the myricin is saponified and calculated from the quantity of potash required for the complete saponification, assuming that 1 c.c. normal alkali neutralizes 0.41 gram cerotic acid and decomposes 0.676 gram myricin. The author obtained the following results:—

	Cerotic Acid.	Myricin.	Total
ENGLISH WAX FROM			
Hertfordshire	14.35	88.55	102.90
"	14.86	85.95	100.81
Surrey	13.22	86.02	99.24
Lincolnshire	13.56	88.16	101.72
Buckingham	14.64	87.10	101.74
Hertfordshire	15.02	88.83	103.85
New Forest	14.92	89.87	104.79
Lincolnshire	15.49	92.08	107.57
Buckingham	15.71	89.02	104.73
Eight samples from merchants	13.12–15.91	86.73–89.58	99.85–105.49
OTHER KINDS OF WAX FROM			
America	15.16	88.09	103.25
Madagascar	13.56	88.11	101.67
Mauritius	13.04	88.28	101.32
"	12.17	95.68	107.85
"	13.72	96.02	109.74
Jamaica	13.49	85.12	98.61
"	14.30	85.78	100.08
Mogadore	13.44	89.00	102.44
Melbourne	13.92	89.24	103.16
"	13.18	87.47	100.65
Sydney	13.06	92.79	105.85
"	13.16	88.62	101.78

The English wax contained an average of 14.4 per cent. cerotic acid and 88.09 per cent. myricin. The foreign kinds were mostly coloured, and some had been adulterated with fat. The organic adulterants are either acids, palmitic or stearic acid; inert or

saponifiable substances, stearin, palmitin, Japanese wax, spermaceti and carnauba wax; or substances which are not acted on by alcoholic potassium hydrate, paraffin. 1 part of stearic acid = 1.448 of cerotic acid; 1 part of palmitic acid = 1.601 of cerotic acid, whilst 1.518 of the latter is equal to 1 of a mixture of these fatty acids; 1 part of a mixture of palmitin and stearin is equal to 2.391 of myricin. Japan wax contained 6.21 per cent. palmitic acid and 94.12 per cent. palmitin. Spermaceti, although as costly as beeswax, is sometimes used as a substitute. Carnauba wax yielded 6.09 per cent. cerotic acid and 92.18 per cent. myricin. It is added to beeswax when the latter has been treated with fat. When paraffin is employed, the percentage of acid and saponifiable matter is reduced in proportion to the quantity of paraffin present, and can be calculated by difference unless other adulterants have been used, in which case it is necessary to determine the paraffin. If A is the percentage of free acid calculated as cerotic acid, and B the unsaponifiable substances calculated as myricin, we obtain the following equation, assuming x to represent the unknown quantity of cerotic acid, y that of the fatty acids, z of myricin, and w of the remaining substances:— $x = 25.649 - (0.1689 A + 0.1073 B)$. $x + 1.518 y = A$; $z = 6.117 x$, and $z + 2.391 w = B$. On multiplying the quantity of cerotic acid by 6.117, we obtain the amount of myricin which, when added to the former, gives the percentage of wax. A mixture of 79.98 per cent. wax and 20.02 fat gave 11.30 per cent. cerotic acid, 69.12 myricin, 0.46 fatty acids, and 19.07 fat, corresponding with 80.42 per cent. wax and 19.53 per cent. fat.

The sp. gr. of beeswax varies from 0.9625 to 0.9575. Paraffin and fat are lighter than beeswax, whilst the fatty acids and resin increase the sp. gr. of beeswax.

Detection of Resin as an Adulterant in Beeswax. E. Schmidt. (*Seifensieder Zeitung*, xvii. 197.) Ten grams of the wax to be examined are to be put in a flask or porcelain dish, 40 to 50 grams of crude nitric acid (sp. gr. 1.32) are added thereto, and the mixture is boiled for one or two minutes; an equal volume of cold water is then added, and lastly ammonia, with shaking or stirring, until the fluid is strongly alkaline and smells of ammonia. It is now poured off from the precipitated wax into a cylindrical vessel. In the case of pure wax the liquid only possesses a yellow colour, but wax which contains resin yields a more or less reddish-brown product, the colour being derived from nitro-compounds formed. From the intensity of the coloration it is possible to determine the amount of resin present.

The Preparation of Lard for use in Pharmacy. Professor Redwood. (*Pharm. Journ.*, 3rd series, xiv. 364.) The first condition to success in obtaining a good preparation is the selection of fresh and perfectly sweet natural fat, which is hung up and freely exposed to air and light. It thus becomes dried and freed from an odour which is present in the freshly slaughtered carcase. It is then carefully examined and adhering portions of flesh or membrane as far as possible removed; after which it is cut up and passed through a machine in which it is mashed so as completely to break up the membranous vesicles in which the fat is enclosed. The magma thus produced is put into a deep jacketed pan, heated by warm water, and the fat is melted at a temperature not exceeding 130° F.

If the flare has been very effectually mashed, the fat may be easily melted away from the membranous matter at 120° F., or even below that, and no further continuance of the heat is required beyond what is necessary for effecting a separation of the melted fat from the membranous or other suspended matter. Complete separation of all suspended matter is obviously important, and therefore filtration seems desirable, where practicable; which, however, it is not on the large scale.

Improved Method of Exhausting Drugs. A. B. Taylor. (*Pharm. Journ.*, 3rd series, xiv. 488.) The process consists in using a portion of the finished preparation (from a previous operation) to macerate and partially exhaust the drug before using the new portion of menstruum; and as there is no limit to the quantity of finished preparation that can be used where necessary, it is possible to exhaust completely the drug operated on.

For example, let it be required to make two pints of tincture of arnica flowers:—

Arnica Flowers, in No. 20 powder	.	.	6 oz. av.
Tincture of Arnica Flowers	.	.	2 pints.
Diluted Alcohol, suff. quant. to make	.	.	4 „

Moisten the powder with a pint of the tincture of arnica flowers, and macerate for twenty-four hours; then pack it firmly in a cylindrical percolator, and gradually pour upon it, first the remainder of the tincture of arnica flowers, and afterwards diluted alcohol, until four pints of tincture are obtained.

The author has used this process with advantage in making the fluid extract and the tinctures of cinchona.

Aqueous Extract of Cinchona Bark. T. Redwood. (*Pharm. Journ.*, 3rd series, xiv. 797.) In view of the numerous discussions and criticisms of the official process for the preparation of cinchona extract, the author has re-investigated this subject, and devised the following improved formulæ:—

Extract of Red Cinchona.

Red Cinchona Bark, in No. 50 powder	. 1 pound.
Distilled Water	. . . . 4 pints.
Hydrochloric Acid	. . . . $\frac{1}{2}$ fluid ounce.

Mix and macerate at a temperature of 180° F. for four hours, stirring frequently, and replacing the water that evaporates. Allow the mixture to cool; then transfer it to a percolator, and when the liquid ceases to pass, carefully introduce distilled water over the surface of the solid matter in the percolator, and continue to percolate slowly until ten pints of liquid have passed, or it is found that what is passing has ceased to give a precipitate on the addition to it of an excess of *liquor sodæ*.

Evaporate the percolated liquid, at the heat of a water-bath, until it is reduced to one pint. Let it cool, then add three pints of distilled water; stir them together while a precipitate is forming; separate the precipitate by filtration; well wash the filter and its contents with distilled water; evaporate the whole of the filtered liquid at a temperature not exceeding 180° F., until it has acquired a syrupy consistence, and dry this either in thin laminæ on the surface of glass, or in thicker masses by exposing it in shallow dishes in a drying closet.

Dissolve twenty grains of this extract in a fluid ounce of distilled water, and add three fluid drachms of *liquor sodæ*. Mix thoroughly, and let it stand for twelve hours, that the precipitate may subside. Collect the precipitate on a filter, wash it first with distilled water rendered alkaline with *liquor sodæ*, and, finally, with water alone; and when it has drained, transfer it to a dish, and dry it at 212° F. Its weight multiplied by five will represent the percentage of total alkaloids in the extract.

Liquid Extract of Red Cinchona.

Extract of Red Cinchona as much as	
contains of total alkaloids	. . 437.5 grains.
Distilled Water	. . . . a sufficiency.
Rectified Spirit	. . . . 5 fluid ounces.

Dissolve the extract with the aid of a gentle heat in twelve

ounces of the water; when cold add the spirit, make up the volume to twenty fluid ounces by further addition of water, and filter.

The principal object in this process has been the production of a liquid extract of known and uniform alkaloidal strength, which, while it possesses the aromatic flavour and astringency of the bark, is free from much inert matter, and from the peculiar extractive (chiefly quinoxin) which in the official liquid extract forms a dense, unsightly, and disagreeable precipitate when diluted with water.

Fluid Extract of Senega. H. J. Rose. (*Canadian Pharm. Journ.*, August, 1883.) The tendency of this extract to gelatinize and form a copious precipitate has provoked considerable investigation, and the remedies advocated have, in the author's experience, but slightly modified the evil. The alkaline treatment, recommended by Dr. Squibb and others, while mitigating the first-named evil, does not seem to prevent the formation of a precipitate, the deposit proceeding slowly for a considerable time, sometimes for months.

The process recommended by C. W. Holmes, of Elmira, that of exhausting a pound of the root with dilute alcohol, evaporating to 11 ounces, filtering and washing the residue, must surely leave a large portion of the polygalin on the filter. The other process, that of Professor P. W. Bedford, is much better; viz., heating the hydro-alcoholic solution quickly to boiling, and then filtering. The only objection is the application of heat, which he states could hardly be accepted in a fluid extract, and gives in preference the United States process, in which ammonia is used, furnishing a product which is said to be unexceptionable in every respect. The author's experience is that this preparation does throw down a precipitate continuously.

The author has found that the addition of a small quantity of neutral spirit of nitrous ether to the menstruum has in his hands proved a very effectual remedy for both the troubles complained of, forming a stable product without the use of glycerine or alkalies, or the application of heat. The menstruum used was:—

Alcohol	7 parts.
Spirit of Nitrous Ether	2 „
Water	7 „

and the process that of the U. S. P. The product has kept some ten months without deposit.

The idea was suggested by some experiments made on the deposit formed in the fluid extract. Various solvents were tried, among others spirits of nitre, which appeared to be quite effective. Its preservative action is still more marked.

Examination of Liquorice Extract. L. J. Schroeder. (*Amer. Journ. Pharm.*, 1884, 311.) The author procured eight samples of liquorice, comprising the most prominent brands of foreign manufacture, as well as several of American make. The examination was confined to the determination of matter insoluble in cold water, of glycyrrhizin soluble in water, and of glycyrrhizin soluble in ammonia. 500 grains of extract of liquorice were macerated in 12 fluid ounces of cold water for twenty-four hours, the mixture was transferred to a filter, and the insoluble matter well washed until the filtrate passed colourless, dried and weighed. The residue of No. 1 was lightest in colour and very smooth; 5 and 6 were somewhat darker, and the others were much darker and gritty. The filtrates likewise varied much in colour and taste, those from 1, 5, and 6 being dark-coloured and of a fine flavour, and the remainder lighter coloured and less pleasant; that from 8 had a peculiar acrid taste. These filtrates were precipitated with diluted sulphuric acid, the precipitates collected upon a filter, washed with acidulated water, redissolved in ammonia, and reprecipitated by sulphuric acid, this operation being repeated several times; the precipitate was finally washed and dried.

The portion insoluble in cold water was treated with dilute ammonia, the filtrate precipitated by diluted acid, and the precipitate purified by redissolving and reprecipitating several times, taking care to frequently filter to take out impurities. The results are tabulated as follows, 500 grains being used in each case :—

Brand.	Residue.		Glycyrrhizin.		
	Weight.	Per cent.	Soluble.	Insoluble.	Total.
	Grains.				Grains.
1. M. & R.	180	36	38	5	43
2. Y. & S.	174	34.8	30	10	40
3. Dean	289	47.8	8	5	13
4. Royal	274	54.8	6	3	9
5. Corigliano	160	30	15	15	30
6. Guzzolini	132	26.4	10	7	17
7. P. & S.	125	25	10	11	21
8. S. C.	180	26	—	13	13

Rapid Determination of the Value of Extract of Malt. J. F. C. Jungk. (*Amer. Journ. Pharm.*, 1883.) A lengthy memoir, from which we extract the following :—

In addition to being readily soluble in water, leaving a pleasant

taste and remaining unfermented for a long time, a good extract of malt should possess the following properties :—

1. The extract should be light in colour; dark coloured preparations are partly burned, therefore contain neither active diastase nor soluble albumen, and differ from ordinary molasses only in containing dextrin.

2. The free acid should not be present over a certain proportion.

3. The proportion of water and solid matters should be within certain limits.

4. The principal determination is that of the diastatic strength. A good extract should contain all soluble substances of the malt, of which diastase is the principal one. If the extract contains no diastase, it differs little from honey or any other saccharine preparation. The action of diastase on amylaceous substances is wanted if the extract is to possess any value for a sick stomach at all.

5. Nitrogenized constituents (albuminates) should be present in an easily digestible form.

Estimation of Solid Matters and Water.—Twenty grams of extract are dissolved in enough distilled water to make the solution weigh 200 grams. With this solution the author determines the percentage of extract by means of a Czeczetka's maltometer, which shows the percentage of extract dried at 110° C. Those not in possession of one, or of a similar instrument, should estimate the specific gravity of the liquid at 17·5 C., and compare the same with a table by Griesmayer, published in *Fresenius Analytische Zeitschrift*, 1880, p. 104, in order to determine the amount of extract. Another method is the following :—

Specific gravity.	Extract dried at 100° C.
1·1032	50 per cent.
1·1053	51 "
1·1075	52 "
1·1096	53 "
1·1117	54 "
1·1138	55 "
1·1159	56 "
1·1180	57 "
1·1202	58 "
1·1235	59 "
1·1258	60 "
1·1281	61 "
1·1305	62 "
1·1329	63 "
1·1353	64 "
1·1377	65 "

Specific gravity.	Extract dried at 106° C.
1.1401	66 per cent.
1.1425	67 "
1.1449	68 "
1.1478	69 "
1.1497	70 "
1.1521	71 "
1.1545	72 "
1.1569	73 "
1.1594	74 "
1.1618	75 "
1.1668	77 "
1.1691	78 "
1.1718	79 "
1.1741	80 "
1.1767	81 "
1.1792	82 "
1.1818	83 "
1.1844	84 "
1.1870	85 "
1.1897	86 "
1.1925	87 "
1.1952	88 "
1.1979	89 "
1.2007	90 "

A certain weight of extract is dissolved in an equal weight of water, the specific gravity of this solution at 17.5° C. is determined, and from the table given the percentage of extract is ascertained. On subtracting the extract from 100, the percentage of water is found.

A good extract containing both diastase and albumen seldom contains more than 25 per cent. of water. Should the percentage of extract fall to 50 or, as with many so-called beers, to 5 or 6 per cent., diastase cannot be present, as it would not keep in such diluted liquids. To such preparations salicylic acid is usually added to prevent for some time the decomposition of the dextrin. On agitating such a preparation with strong ether, the salicylic acid is easily separated. Evaporate the ethereal solution, dissolve the residue in water, and test this solution with diluted ferric chloride, when the salicylic acid is easily recognised by the violet colour produced. If we reflect that the addition of one-fourth to one-half per cent. of salicylic acid to solutions of starch renders even preparations very rich in diastase inactive, it becomes obvious that the addition of this acid to an extract of malt is incorrect.

Determination of Free Acid.—The free acid of freshly prepared

extract of malt is almost exclusively lactic acid; but with the age of the preparation other acids are formed, and for this reason the author estimates the amount of caustic soda used, and notes this as percentage. In a solution of pure caustic soda, 5 grams to 1000 c.c. water, each c.c. represents 0.005 sodium hydrate. Ten grams of extract are dissolved in 100 grams of water and neutralized with the soda solution. For this purpose a burette graduated into one-tenth c.c. is used, and the point of neutralization determined by means of very sensitive litmus paper. With a little practice the estimation of the acid does not present any difficulty. Good extract of malt tested by this method will seldom require more than 6 to 7 c.c. soda solution.

Estimation of Diastasic Strength.—Twelve clear and uniform two-ounce vials, each filled with 2 ounces of distilled water and 2 drops of iodine solution, prepared from 2 grams of iodine, 4 grams of iodide of potassium, and 250 grams of water; a good thermometer and starch mucilage are needed for this purpose.

Ten grams of starch are stirred with 30 grams of water, and poured into 125 or 150 grams of boiling water. The mixture is stirred and boiled for some time. The thermometer is then introduced, and the mucilage is allowed to cool to and kept at a temperature of 100° F. by means of a water-bath.

Ten grams extract of malt dissolved in 10 c.c. of water are then stirred into the mucilage, the time being accurately noted. After one minute a good extract will have converted the thick mucilage into a thin liquid. As soon as this change has taken place, it is necessary to examine the progress of the conversion of starch into soluble starch, dextrin, and sugar at the end of every minute, by the following method:—

After the expiration of the first minute transfer two drops, by means of a glass rod, into one of the two-ounce bottles. The bottle is shaken and placed near a window. At the end of every minute repeat this manipulation with a new bottle, until the coloration is no longer produced. The time necessary for effecting this change gives the indication as to the amount of diastase present. Undecomposed starch mucilage gives a greenish blue colour, and after standing some time a blue precipitate. Soluble starch, the first product of the change, yields with iodine a dark blue solution without a precipitate. If the amount of soluble starch equals that of dextrin and sugar, the colour of the solution will be purple. As the soluble starch disappears, the solution will be of a decided red colour if dextrin predominates, or faintly red if the sugar be in

excess; and when starch and most of the dextrin have been converted into sugar, the liquid will be nearly or entirely colourless. This experiment is very interesting and is simple to perform.

A good extract of malt should convert its own weight of starch within ten minutes at 100° F.; at 62° F. forty minutes will be necessary for the conversion, and at 150° F. only three minutes. An extract of malt of the above strength will convert five times its weight of starch at 100° F. in forty minutes, and eight times that amount in ninety minutes.

Influence of Acids and Alcohol on Diastase and the Conversion of Starch.—The author gives a lengthy account of his experiments in this direction, illustrated by a tabular statement of the results, in comparison with the action of saliva. It is shown in these that the diastasic action of extract of malt and of saliva is but little affected by the presence of alcohol in the starch solution, but is influenced by the acid.

Determination of the Nitrogenized Bodies.

Albuminates.—For this estimation the author uses a solution of picric acid in water, saturated in the cold; also a glass tube such as is used for the estimation of nitrogen in elementary analysis, divided into one hundred equal parts, the lower five divisions being further divided into fifths; but any tall, narrow glass cylinder, which is divided accurately into equal parts, will answer the purpose. The cylinder is filled with 80 parts of the solution of picric acid, and 20 parts of extract of malt, and well agitated until the extract is dissolved with the exception of the albumen, then placed in a vertical position for twenty-four hours, and the quantity of precipitate read off. Each division represents 1 per cent. by weight of albumen (nitrogenous matter) dried at 100° C.

The correctness of this estimation is reliable within $\frac{1}{4}$ per cent., and has been verified by a series of elementary analyses, undertaken by the author with the view of convincing himself of the exactness of this method, which may be approximately proved by coagulating the albumen by boiling. This last method is never exact, since malt contains some nitrogenous matter which is not coagulated by heat.

The average amount of nitrogenous matter contained in extract of malt of the consistency of honey, is 3 to 3.25 per cent. A well-prepared extract of malt produces, with cold water, a faintly turbid solution, which becomes much clearer if carefully heated to 150° F.

The above described determinations with extract of malt furnish

the proof as to whether the preparation is of good quality or is worthless.

Weigh from 2 to 5 grams of extract of malt; mix with 20 grams of dry sand which has been previously washed with hydrochloric acid and water, and dry this mixture in an air-bath at 100° C. until it ceases to lose weight. The loss of weight represents the amount of water.

Transfer the mixture into a small glass percolator (glass syringe) supported by a wire stand of such a size that the entire apparatus may be weighed on an analytical balance. Dry thoroughly in an air-bath and weigh. Now percolate with strong ether, evaporate the percolate, and dry the residue; its weight indicates the *resin of hops*. The apparatus is also dried in the air-bath and weighed; the loss in weight shows likewise the resin of hops.

Then percolate with a mixture of two volumes of absolute alcohol and three volumes of concentrated ether until a drop of the percolate heated on a platinum foil will not char. The loss of weight after drying in air-bath represents *glycerin*. A mixture of chloroform and alcohol cannot be used as a solvent for glycerin, as the malt sugar is somewhat soluble therein.

Exhaust the residue completely with stronger alcohol; dry, and weigh. The loss of weight gives the amount of *sugar*.

The balance, after subtracting the weight of sand, is *dextrin* and *albumen*. The dextrin may also be extracted with hot water, and determined from the loss of weight.

After igniting the sand, its weight must be the same as in the beginning. The difference in weight before and after ignition indicates the weight of albumen.

Examination of Quinine Pills. J. F. C. Jungk. (*Amer. Journ. Pharm.* 1883, 434.) The author describes several methods for the estimation of quinine in these pills, and gives preference to the following, as yielding the most satisfactory results:—

The pills are rubbed into a smooth paste with a little water, 2 drops of diluted sulphuric acid being added for each grain of quinine sulphate. A quantity of recently slaked lime equal to three times the weight of the pills is well mixed with the paste; then the same weight of well-washed and dried fine sand is added; the whole is thoroughly triturated and dried at a moderate heat, when it can be easily powdered and readily removed from the mortar without loss. The fine powder thus obtained is placed in a small glass percolator, which is fixed to an accurately tared flask by means of a twice perforated cork. The percolator is connected

with a back-flow cooler, or reversed condenser, such as is used in plant analysis, and which has often been described. For every 20 grains of sulphate of quinine, 2 or 3 fluid ounces of chloroform are now poured on the powder or into the flask. The apparatus is then put together, and the flask heated by means of a sand-bath to 70–80° C.

If the distillation and condensation of the chloroform proceeds regularly, the whole quantity of the quinine will be extracted in about one hour. The apparatus is allowed to cool, a small quantity of chloroform is poured into the percolator, and a drop coming through evaporated on a watch glass. If a residue remains, it is dissolved in a little chloroform, and put back on the powder, and $\frac{1}{2}$ to 1 fluid ounce of chloroform more added. If no residue remains on the watch glass, and the drop causes no opacity with diluted acid and a solution of iodide of mercury and potassium, the heating is continued for ten or fifteen minutes longer, so as to be certain that all the quinine has been extracted. Now allow the apparatus to cool, evaporate the chloroform in the tared flask, and dry the residue by means of an air-bath and a moderate heat, until the weight remains constant. The residue will represent the amount of quinine, if it answers to the test of pure quinine. If the pills represented 20 grains of quinine sulphate, the residue should weigh 14·86238 grains, or 0·961 gram.

Report on the Strength of Commercial Specimens of "Spiritus Ætheris Nitrosi." W. H. Symons. (*Pharm. Journ.*, 3rd series, xiv. 281.) For determining the amount which separated when the spirit was "agitated with twice its volume of saturated solution of chloride of calcium," a 75 c.c. pipette was closed at its point by fusion, and the adjoining tube graduated; the tube at the other end of the bulb was cut off, at about 2 c.m. beyond the 75 c.c. mark, and fitted with a cork. Fifty cubic centimetres of saturated solution of chloride of calcium were then introduced, and the pipette surrounded by ice and water. In a few minutes the spirit to be tested was carefully poured in, so as not to disturb the solution. The cork being replaced, the pipette was well shaken, and afterwards allowed to remain in the cold water (with the graduated tube uppermost) for one hour. The amount of ethereal liquid which rose, multiplied by four, gave the required percentage.

In estimating the total nitrites, the process described by Professor J. F. Eykman (*Pharm. Journ.*, 3rd series, xiii. 63) was used. The formula for calculation of results being $\frac{V}{S \times a} \cdot \frac{H - e}{273 + t} \cdot 0.1207 =$

Samples.	Specific Gravity.		Prepared according to Pharmacopœia.	When shaken with two vols. sol. CaCl ₂ , there separates	Result of Analysis upon 5 c.c. (by Eyrman's process).	Percentage of Ethyl Nitrate.
	Nominal.	Actual.				
No. 1	.845	.850	British, 1867	10 per cent. (sic)	56.5 c.c. N O at 17° C. and 752 m.m.	4.08
2	.845	.845	" "	1.8 "	46.5 c.c. N O at 17° C. and 752 m.m.	3.38
3	.845	.845	" "	.8 "	38.0 c.c. N O at 17° C. and 752 m.m.	2.76
4	.845	.843	" "	Nothing.	31.5 c.c. N O at 16° C. and 756 m.m.	2.36
5	.845	.846	" "	Traces.	26.5 c.c. N O at 17° C. and 752 m.m.	1.92
6	.845	.849	" "	Nothing.	19.0 c.c. N O at 17° C. and 752 m.m.	1.37
7	.845	.845	" "	"	13.5 c.c. N O at 17° C. and 752 m.m.	.98
8	.845	.841	" "	"	12.0 c.c. N O at 18.5° C. and 753 m.m.	.86
9	.845	.867	" "	"	6.5 c.c. N O at 17° C. and 752 m.m.	.46
10	.845	.858	" "	"	4.9 c.c. N O at 17° C. and 752 m.m.	.35
11	.845	.850	" "	"	4.0 c.c. N O at 17° C. and 752 m.m.	.29
12	.834	.885	London, 1851	"	12.5 c.c. N O at 17° C. and 752 m.m.	.92
13	.834	.831	" "	"	11.5 c.c. N O at 17° C. and 752 m.m.	.85
14	.834	.839	" "	"	11.2 c.c. N O at 18° C. and 748 m.m.	.81
15	.850	.851	" 1746	"	24.2 c.c. N O at 18° C. and 748 m.m.	1.73
16	.850	.848	" "	"	16.5 c.c. N O at 17° C. and 752 m.m.	1.20
17	.850	.844	" "	"	8.6 c.c. N O at 17° C. and 752 m.m.	.63
18	.850	.837	" "	"	5.0 c.c. N O at 18° C. and 748 m.m.	.36
19	.850	.856	" "	"	4.0 c.c. N O at 17° C. and 752 m.m.	.29
20	.850	.855	" "	"	2.5 c.c. N O at 17° C. and 752 m.m.	.18
21	—	.845	<i>Vide infra.</i>	1.7 per cent.	48.0 c.c. N O at 17° C. and 752 m.m.	3.49

percentage of ethyl nitrite. V represents c.c. of NO , H the barometric pressure, e the tension of aqueous vapour, S the sp. gr. of the spirit, a the number of c.c. used for assay, and t the temperature. The constant $0.12071 = \left(\frac{100 \times 273 \times 75 \times .08961}{760 \times 1000 \times 2} \right)$.

The quantities of nitric oxide, and therefore of ethyl nitrite, in the table are in each case the mean of two or more experiments. The samples were, with the following five exceptions, obtained direct from London wholesale druggists. Nos. 2 and 14 the author distilled himself according to the directions of the British and London Pharmacopœias respectively. From the house that supplied the author with No. 1, as a sample, Nos. 9 and 10 were indirectly obtained; the latter having been purchased previously, the former afterwards. No. 21 was a 10 per cent. (by volume) solution in spirit (sp. gr. 0.834) of the ethereal liquid which rises on applying the B. P. test. The result indicates that this substance contains about 35 per. cent. of ethyl nitrite. Its variability is, however, shown by Nos. 4 and 5; No. 5, probably containing more paraldehyde, threw up a trace, whereas No. 4, richer in ethyl nitrite, did not. No. 4 was purchased in May; it did not then separate anything with solution of chloride of calcium; it was kept in a capped ether bottle till October, when it was found to contain no more free acid than the other specimens, which were new.

From the above it will be seen that this preparation is far from what it should be. The author is led to suppose that the manufacturers have not taken proper care in condensing the distillates by means of ice. It should be remembered that ethyl nitrite boils under 17°C. , at normal pressure, and is therefore easily lost.

Where it is not possible or convenient to carry out Eykman's process, the Pharmacopœia sulphate of iron test (with weighed quantities) is quite capable of showing which is the better of two preparations. It may be applied as follows: 1 part of ferrous sulphate is dissolved in 5 parts of dilute sulphuric acid (B.P.), and to separate portions of 10 parts of this solution 1 part of the spirit to be tested is added. The dark coloured mixtures may be then placed in glass vessels of equal diameter, and diluted with water until their tints viewed horizontally are similar. The amount of dilution shows the comparative strength. Attempts were made to obtain absolute quantitative results, using a standard solution of nitrite of potassium for comparison, and the usual process for colorimetric tests, but the results obtained were invariably too low; probably because the nitrite of potassium solution responds more

thoroughly to this test, at the ordinary temperature, than does nitrite of ethyl.

Spiritus Ætheris Nitrosi: Composition in Relation to Deterioration. P. MacEwan. (*Pharm. Journ.*, 3rd series, xiv. 817.) The decomposition occurring in spiritus ætheris nitrosi is attended by at least three marked changes which can be physically and chemically determined:—

1. Increase of specific gravity.

2. Diminution of the volume of ethereal liquid separated by saturated chloride of calcium solution.

3. Development of acidity.

Increase of Specific Gravity.—In the following table, I. to V. are samples of B. P. spirit made by the author, or procured as such; VI. is spirit answering the B. P. tests raised to .850 with water; and VII. is the .850 of the London Pharmacopœia.

	Made.	When Examined.	Sp. Gr. at 50° F.
I.	Not known	May, 1883 . . . . .	.848
I.	Not known	March, 1884 . . . . .	.853
II.	Not known	May, 1883 . . . . .	.852
II.	Not known	March, 1884 . . . . .	.8576
III.	Nov., 1883	March, 1884 . . . . .	.852
IV.	Received Nov., 1883 . . .	March, 1884 . . . . .	.8516
V.	Feb. 14, 1884	Feb. 14, 1884 . . . . .	.846
V.	" "	Feb. 21, 1884 . . . . .	.850
V.	" "	March 7, 1884 . . . . .	.8516
VI.	Feb. 15, 1884	March 7, 1884 . . . . .	.8536
VII.	Received Nov., 1883 . . .	Feb. 14, 1884 . . . . .	.856
VII.	" "	March 7, 1884 . . . . .	.859

Diminution of Separation Volume.—In this the author gives the result of his examination of two specimens of the B. P. spirit kept under different conditions,— α , in a well-stoppered and almost full bottle, which was opened frequently, and β kept in a badly stoppered bottle, half full, and between the second and third observations the stopper was accidentally left out over a night.

α February 14 . . . 2 per cent.	β February 14 . . . 2 per cent.
" 21 . . . 1.75 "	" 18 . . . 1.33 "
March 7 . . . 1.33 "	" 21 . . . Nil.

The Development of Acidity.—The free acids existing in the spirit are acetic and nitrous acids. It has been stated that nitric acid is also present, but the ordinary methods for determining the existence of nitric acid in presence of the nitrous, are inapplicable in this case.

It is questionable, however, if nitric acid can exist as such in presence of the readily oxidizable constituents of the spirit. The author has, therefore, calculated the inorganic acid as nitrous acid (HNO_2).

The free acids were determined volumetrically, semi-normal solution of soda was used, methyl orange being taken to indicate nitrous acid, and phenolphthalein to indicate total acidity.

In the following table the results of several observations are given in percentages, the proportion of ethyl nitrite and aldehyde (as far as determined) being also given. I. to IV. are B. P. spirit (α and β of the separation paragraph are II. and III.); VII. is B. P. raised to '850, and the others are the '850 of the London Pharmacopœia.

	Date or Age.	HNO_2 .	$\text{CH}_3\text{H}_2\text{O}_2$.	$\text{C}_2\text{H}_5\text{NO}_2$.	$\text{C}_2\text{H}_4\text{O}$.
I.	May, 1883	0.47	1.20	0.87	0.80
I.	March, 1883	0.773	0.329	0.095	2.50
II.	One week	0.215	0.206	3.54	0.85
II.	Two weeks	0.257	0.247	—	0.95
II.	Three weeks	0.274	0.349	3.14	—
III.	Two days	—	—	2.01	0.80
III.	Four days	0.24	0.216	—	1.14
III.	One week	0.322	0.246	1.24	2.00
IV.	One month	0.247	0.411	1.93	1.67
V.	Four months	0.161	0.288	3.53	1.5
VI.	Four months	0.352	0.494	1.64	1.426
VII.	Four months	0.418	0.206	0.92	2.5
VIII.	Four months	0.194	0.247	0.22	0.2
IX.	As received	0.188	0.42	—	—

Referring to the usual objections raised against the B. P. preparation, and to the often repeated superiority of the '850 spirit, the author shows both to be untenable and not supported by the actual facts of the case. His paper also deals with explanations respecting the cause of the various changes discussed in it.

Spirit of Nitrous Ether. D. B. Dott. (*Pharm. Journ.*, 3rd series, xiv. 819.) The author offers adverse criticism on the tests given in the British Pharmacopœia for ascertaining the quality and strength of this preparation, and describes a number of experiments made by him with the object of determining the best practical method for estimating the proportion of nitrous ether. As the result of these experiments he recommended the following process:—Dissolve 1 gram of iodide of potassium in 10 c.c. of water. Then add 20 c.c. of rectified spirit, and to the solution so obtained add 5 c.c. of the spirit to be tested. Now pour in 5 c.c. of dilute

sulphuric acid, and allow to stand for an hour, then titrate with standard thiosulphate.

The operation is best conducted in an eight-ounce porcelain basin. The following are some of the results obtained :—

(5 c.c. used in each case.)	$\frac{1}{5}$ Na ₂ S ₂ O ₃ solution.	EtNO ₂ grams.	EtNO ₂ (vol.) per cent.
(a) 10 per cent. (vol.) solution in alcohol.	59.5 c.c. =	.446 =	9.91
(a) 10 per cent. (vol.) solution in alcohol.	59.8 c.c. =	.448 =	9.96
(a) 10 per cent. (vol.) solution in alcohol.	60.0 c.c. =	.450 =	10.00
(b) Sple. sp. æth. nit. (recent).	26.5 c.c. =	.198 =	4.41
(b) Sple. sp. æth. nit. (recent).	26.8 c.c. =	.201 =	4.46
(c) Sple. sp. æth. nit. (four months)	23.5 c.c. =	.176 =	3.91
(c) Sple. sp. æth. nit. (four months)	24.0 c.c. =	.180 =	4.00

It should be noted that the total nitrous acid is given as ethyl nitrite. The older sample contained much more free acid than the fresh one. The above method is recommended as only approximate, but one that may serve until a better one is devised. It has the advantage of requiring only such apparatus and reagents as are in common use.

Tincture of Cinchona. E. G. Hogg. (*Pharm. Journ.*, 3rd series, xiv. 444.) The experiments described in this paper show that, in preparing this tincture according to the official process of the B.P., the bark is only deprived of one-half the proportion of total alkaloids contained in it. The author intends to elaborate a process ensuring a complete exhaustion of the bark, and to publish it in due course.

Aqueous Extract of Cinchona Bark. Prof. Redwood. (*Pharm. Journ.* 3rd series, xiv. 797.) In trying to work out an improved process for the preparation of this extract, the author was led by the following considerations based upon previous experience :—

1. That the red, or succirubra bark is the sort most suitable for use in these operations.

2. That the extracting liquid should be water, an acid being used to render the active medicinal constituents of the bark soluble in this menstruum.

3. That the bark should be exhausted of its alkaloids in the process adopted, and that the extract should contain such other constituents of the bark as are considered to be medicinally valuable.

4. That the liquid extract should contain a specified quantity, say 5 per cent., of the mixed alkaloids of the bark.

5. That the liquid extract should admit of dilution with water without becoming turbid, and, on the other hand, that it might be evaporated to dryness without impairing its solubility to any appreciable extent.

The process recommended is as follows:—

Extract of Red Cinchona.

Red Cinchona Bark, in No. 50 powder	. 1 pound.
Distilled Water.	. . . . 4 pints.
Hydrochloric Acid	. . . . $\frac{1}{2}$ fluid ounce.

Mix and macerate at a temperature of 180° F. for four hours, stirring frequently, and replacing the water that evaporates. Allow the mixture to cool; then transfer it to a percolator, and when the liquid ceases to pass, carefully introduce distilled water over the surface of the solid matter in the percolator, and continue to percolate slowly until ten pints of liquid have passed, or it is found that what is passing has ceased to give a precipitate on the addition to it of an excess of *liquor sodæ*.

Evaporate the percolated liquid, at the heat of a water-bath, until it is reduced to one pint. Let it cool, then add three pints of distilled water; stir them together while a precipitate is forming; separate the precipitate by filtration; well wash the filter and its contents with distilled water; evaporate the whole of the filtered liquid at a temperature not exceeding 180° F., until it has acquired a syrupy consistence, and dry this either in thin laminæ on the surface of glass, or in thicker masses by exposing it in shallow dishes in a drying closet.

Dissolve 20 grains of this extract in a fluid ounce of distilled water, and add three fluid drachms of *liquor sodæ*. Mix thoroughly and let it stand for twelve hours, that the precipitate may subside. Collect the precipitate on a filter, wash it first with distilled water rendered alkaline with *liquor sodæ*, and finally with water alone, and when it has drained transfer it to a dish and dry it at 212° F. Its weight multiplied by five will represent the percentage of total alkaloids in the extract.

Liquid Extract of Red Cinchona.

Extract of Red Cinchona, as much as	
contains of total Alkaloids	. 437·5 grains.
Distilled Water	. . . . a sufficiency.
Bectified Spirit	. . . . 5 fluid ounces.

Dissolve the extract with the aid of a gentle heat in twelve ounces of the water, when cold add the spirit, make up the volume to 20 fluid ounces by further addition of water, and filter.

The principal object in this process has been the production of a liquid extract of known and uniform alkaloidal strength, which, while it possesses the aromatic flavour and astringency of the bark, is free from much inert matter, and from the peculiar extractive (chiefly quinovin) which, in the official liquid extract, forms a dense, unsightly and disagreeable precipitate when diluted with water.

The Alkaloidal Strength of *Tinctura Cinchonæ Flavæ*. J. O. Braithwaite. (*Pharm. Journ.*, 3rd series, xiv. 445.) The following are the results of examinations of eleven samples of tincture. Nos. 1 to 4 being prepared by the author himself, and the others being samples of the commercial article.

No. of Sample	Total Alkaloid.		Ether-Soluble Alkaloid.		Specific Gravity.	Remarks.
	Grams in 100 c.c.	Grains in fʒj.	Grams in 100 c.c.	Grains in fʒj.		
1	0.470	2.05	0.345	1.51	0.9350	Made from a rich commercial quilled calisaya containing 5.224 per cent. total alkaloid and 2.697 ether-soluble alkaloid.
2	0.586	2.84	0.444	1.94	0.8747	Made from the same bark as No. 1, but using rectified spirit instead of proof.
3	0.490	2.14	0.326	1.42	0.9330	Made from commercial calisaya, containing much colouring matter.
4	0.379	1.65	0.161	0.70	0.9256	Made from commercial calisaya, containing 4.392 per cent. total alkaloid, 1.06 per cent. of ether-soluble extract.
5	0.430	1.83	0.254	1.11	0.9289	Trade sample.
6	0.279	1.22	0.078	0.4	0.9374	" "
7	0.350	1.53	0.070	0.3	0.9357	" "
8	0.285	1.24	0.170	0.74	0.939	" "
9	0.417	1.82	0.140	0.61	0.9489	" "
10	0.356	1.55	0.202	0.88	0.9511	" "
11	0.409	1.78	0.204	0.89	0.9346	" "

It will be noticed that in No. 2, where rectified spirit has been used to exhaust, the yield of alkaloid is considerably increased.

Dr. Redwood's Process for Liquid Extract of Cinchona. A. J. Cownley. (*Pharm. Journ.*, 3rd series, xiv. 877.) The author publishes a number of analyses of red cinchona bark and the corresponding liquid extracts made from it by Dr. Redwood's process. The results tend to show that the extraction of the total alkaloids

is not complete, and that the relative proportions of the individual alkaloids are different as compared with the original bark. There seems to be a relative deficiency of quinine, together with a relative preponderance of amorphous alkaloid. These results are confirmed by analyses of the residual bark left after extraction. The author therefore arrives at the conclusion that the proposed treatment with hydrochloric acid does not furnish a preparation that can be considered to represent cinchona bark in such a manner that a fluid ounce of the liquid extract shall contain all the valuable medicinal properties of an ounce of the drug.

Tincture of Nux Vomica. W. R. Dunstan and F. W. Short. (*Pharm. Journ.* 3rd series, xiv. 441.) The experiments recorded in this paper show that rectified spirit exhausts nux vomica less than a weaker spirit; and for this reason the authors recommend a menstruum of 4 volumes of rectified spirit and 1 volume of water. In no case were the alkaloids completely extracted by strong or by weak spirit, but with an addition to the spirit of 1.5 per cent. of sodium chloride the extraction was complete.

Experiments are also described indicating that there is no very ready means of obtaining a perfectly stable tincture of nux vomica from the solution of the extract in alcohol.

Extract of Nux Vomica. W. R. Dunstan and F. W. Short. (*Pharm. Journ.* 3rd series, xiv. 443.) Further experiments made with the object of establishing a good method of estimating the alkaloids in extract of nux vomica, have led the authors to adopt the following process:—

About 1 gram of the extract is dissolved in a strong solution of sodium carbonate with the aid of a gentle heat. This solution is extracted with two consecutive 15 c.c. of chloroform. The mixed chloroform solutions are extracted with two consecutive 15 c.c. of dilute sulphuric acid (5 per cent.), and from the mixed acid solutions, which should be filtered if necessary, the total alkaloid is extracted after the addition of ammonium hydrate by agitation with chloroform, two separate quantities of 15 c.c. being generally sufficient. The clear chloroform solutions are evaporated to dryness upon the water-bath, and the residue of total alkaloid weighed after exposure for one hour. The alkaloidal residue thus obtained was shown to be pure by applying the ammonia-tannin process, which the authors have fully described in a former paper. The following is a typical result:—(α) amount of alkaloid originally found; (β) amount of pure alkaloid obtained by ammonia-tannin process.

α—0.164. β—0.161.

Twelve commercial specimens of extract of *nux-vomica* were now analysed, the total alkaloid being estimated in the manner above described, and the strychnine by a method of precipitation as ferrocyanide, as described in a previous paper (*Year-Book of Pharmacy*, 1883); the brucine was estimated by difference. In addition the quantity of "moisture" indicated by the loss at 100° C. has in all cases been determined. The results are recorded in the following table:—

Analyses of Extracts of Nux Vomica.

No.	Percentage of Moisture.	Percentage of total Alkaloid.	Percentage of Strychnine.	Percentage of Brucine.
1	16.7	15.15	6.63	8.52
2	19.7	15.64	7.44	8.20
3	15.5	10.82	4.19	6.13
4	15.7	15.16	7.08	8.08
5	16.0	12.49	5.53	6.96
6	13.9	12.53	5.17	7.36
7	13.8	12.25	4.87	7.38
8	17.3	17.54	7.52	10.02
9	13.6	15.78	6.41	9.37
10	16.0	15.94	6.84	9.10
11	17.3	16.24	5.81	10.43
12	15.9	17.12	8.58	1.54

These results exhibit a serious want of uniformity in the alkaloidal strength of this extract.

Preparation of a Standard Tincture of Nux Vomica. W. R. Dunstan and F. W. Short. (*Pharm. Journ.*, 3rd series, xiv. 622.) The following is a description of two processes devised by the authors for the preparation of a standard tincture of *nux vomica* containing 0.24 per cent. of total alkaloid:—

I.

Nux Vomica in fine powder . . .	1 pound.
Rectified Spirit	64 fl. ozs.
Distilled Water	16 „

Mix the spirit with the water, and make the *nux vomica* into a paste with one pint of the mixture. Allow this to macerate for twelve hours, then transfer to a percolator and add another pint of the mixture. When this has percolated, pour on the remainder of the diluted spirit in successive portions; press the marc, filter the expressed liquid, and add it to the percolate. Take of this liquid 1 fluid ounce, and estimate the amount of total alkaloid in the following way: Evaporate almost to dryness over a water-bath, dissolve

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the residue in 2 fluid drachms of chloroform and half a fluid ounce of dilute sulphuric acid with an equal bulk of water; agitate, and warm gently. When the liquids have separated, draw off the chloroform and add to the acid liquid excess of solution of ammonia and half a fluid ounce of chloroform; well agitate, gently warm, and after the liquids have completely separated, transfer the chloroform to a weighed dish. Evaporate over a water-bath, and dry for one hour at 212° F. Allow the residue of total alkaloid to cool, and then weigh.

Take that quantity of the percolate which contains 20 grains of alkaloid, and dilute to 1 pint with a mixture of 4 parts by volume of rectified spirit with 1 part by volume of distilled water. This tincture will contain 0.24 per cent. of total alkaloid; and 2 fluid ounces of it, when estimated in the same manner as the percolate, should yield 2 grains of total alkaloid.

II.

Standard Extract of Nux Vomica	133 grains.
Rectified Spirit	16 fl. ozs.
Distilled Water	4 „

Mix the spirit with the water, and dissolve the extract in the mixture. One fluid ounce of this tincture will contain one grain of total alkaloid.

The Preparation of a Standard Extract of Nux Vomica. W. B. Dunstan and F. W. Short. (*Pharm. Journ.*, 3rd series, xiv. 621.) The authors give the following description of their process:—

Prepare a percolate and estimate the percentage of alkaloid in it in exact accordance with the directions given in the preceding article. Take of the percolate as much as contains 131½ grains of total alkaloid, and evaporate over a water-bath until the extract weighs two ounces. This extract will contain 15 per cent. of total alkaloid.

Ten grains of this extract when treated in the following manner should yield one and a half grains of total alkaloid. Dissolve the extract in half a fluid ounce of water with the aid of a gentle heat, and add a drachm of carbonate of sodium previously dissolved in half a fluid ounce of water; add half a fluid ounce of chloroform, agitate, warm gently, and separate the chloroform. Add to this half a fluid ounce of dilute sulphuric acid, with an equal bulk of water, again agitate, warm, and separate the acid liquid from the chloroform. To this acid liquid add now an excess of ammonia, and agitate with half a fluid ounce of chloroform; when the liquids

have separated, transfer the chloroform to a weighed dish and evaporate the chloroform over a water-bath. Dry the residue for one hour, and weigh.

Volumetric Process for Estimating the Alkaloidal Strength of Extract of Nux Vomica. G. F. Schacht. (*Pharm. Journ.*, 3rd series, xiv. 851.) The author recommends a method of titration based on the recommendations of Dragendorff. It is worked as follows :—

Prepare a test solution of potassic mercuric iodide by mixing 1·355 grams of perchloride of mercury with 4·98 grams of iodide of potassium and water to make 1 litre. Each c.c. of this solution precipitates 0·00184 gram of mixed strychnine and brucine.

Dissolve 1 gram of the extract to be examined in 30 c.c. of water, acidulated with 1 c.c. of hydrochloric acid, warm gently for half an hour, and cool. Filter through paper, and wash with water until the filtrate measures 100 c.c.

Of this solution take 10 c.c. in a small beaker, and drop in from a burette sufficient of the test solution to throw down the whole of the alkaloids.

The point of completion may be determined, almost certainly, by the clearness of the supernatant liquor after stirring the whole with a glass rod, and may be confirmed by the addition of ammonium sulphide to a little of the filtered mixture which would render evident any excess of the precipitant. But the experiment is so easily and quickly performed that the result may be confirmed again and again with fresh quantities (10 c.c.) of the original solution under examination.

Of such a solution of 1 gram of extract, 10 c.c. were found to require 9·7 c.c. of the test solution, and $0\cdot00184 \times 10 \times 9\cdot7 = 0\cdot17848$; therefore, the sample contained 17·848 per cent. of mixed alkaloids.

This result coincides very nearly with those obtained by Messrs. Dunstan and Short, and by the author when employing the more elaborate method.

Tincture of Hyoscyamus. W. Gilmour. (*Pharm. Journ.*, 3rd series, xiv. 781.) The author's observations show :—

1. The fact that the spectroscope does *not* distinguish between a tincture made from an annual or a biennial plant.

2. That the milky turbidity on the addition of water is not a test to distinguish the one from the other; but it is a fairly good test as to the quality, so far as age, exposure, etc., of the biennial plant is concerned.

3. That a proof spirit tincture, although quickly changing so far as the chlorophyll matter is concerned, does not show this change to any extent to the naked eye, while the more important chemical changes which ultimately affect the quality of the tincture therapeutically are comparatively slow.

4. That a rectified spirit tincture undergoes very rapid changes, which are very conspicuous to the naked eye, and which are almost certain to end in rapid chemical changes affecting the therapeutic value (if it possesses any) of the tincture.

5. That the rectified spirit does not possess the same power of exhausting the henbane of its extractive matter as proof spirit.

6. That a rectified spirit tincture and a proof spirit tincture are quite unlike in their appearance; so much so as practically to make them unrecognisable.

Tinctura Digitalis. Dr. H. Stieren. (*Apoth. Zeitung*, 1883, 122.) The author has microscopically examined a sediment formed in tincture of foxglove which had been kept in a stoppered bottle for two years. It consisted of chlorophyll, reddish brown waxy matter, and of a yellowish, more or less crystalline substance, supposed to be digitalin. The precipitate was dissolved in one ounce of alcohol of 0·88 sp. gr., filtered, and mixed with the remaining 15 ounces of the tincture, which was then made up to the original volume of 16 ounces (it having lost one ounce by evaporation during the two years.) This addition changed the reddish brown colour of the tincture to the dark greenish brown colour of a fresh tincture of foxglove. The author calls particular attention to the partial separation of active principles likely to occur with the deposition of precipitates in tinctures.

Tincture Deposits. R. A. Cripps. (*Pharm. Journ.*, 3rd series, xiv. 483.) The author has examined the precipitates formed in a number of official tinctures and reports as follows:—

The deposits found in tincture of calumbo, compound tincture of cardamoms, compound tincture of chloroform, compound tincture of gentian, ethereal tincture of lobelia, and tincture of quinine, proved to consist of inert substances only; so that these tinctures had lost none of their medicinal activity. The deposit from compound tincture of cinchona bark, however, contained 3·064 per cent. of alkaloids, chiefly cinchonine, and also cinchotannic acid. In the sediment from *tinctura cinchona flavæ* he found cinchotannic acid, cinchona-red, and a variable proportion of alkaloids, the latter amounting in one instance to 6·37 per cent., of which 2·94 per cent. were quinine. The deposit from a sample of *tinctura ferri acetatis*

proved to represent 69·7 per cent. of ferric oxide. The sediment from tincture of rhubarb was found to contain 2·17 per cent. of chrysophanic acid, and about 37 per cent. of calcium oxalate.

Tincture and Fluid Extract of Calumbo. G. W. Kennedy. (*Amer. Journ. Pharm.*, 1883, 402.) The author reports to the Pennsylvania Pharmaceutical Association that the best menstruum for exhausting calumbo is a mixture of 70 parts of alcohol, 15 parts of glycerin, and 15 parts of water. The percolation for the fluid extract is finished with a mixture of 7 parts of alcohol and 3 of water.

Source of the Pungency in Tincture and Liniment of Iodine. W. H. Darling. (*Pharm. Journ.*, 3rd series, xiv. 21.) MacEwan and Gregory have called attention to the pungency observed in some samples of liniment and tincture of iodine made with methylated spirit, and both attribute this to the presence of allyl alcohol. While admitting that the pungency may be partly due to this cause, the author thinks that it must be mainly attributed to the presence in the methylated spirit of acetone, the halogen compounds of which are of an extremely irritating nature.

Medicated Waters. J. W. England. (*Amer. Journ. Pharm.*, Feb. 1884.) The author proposes the following general formula for preparing the officinal medicated waters:—Triturate, in a mortar of broad surface, the oil dissolved in the alcohol with precipitated calcium phosphate, until a dry powder is secured and all the alcohol has volatilized; then add the water in small portions at a time, stirring after each addition, until the intended quantity to be made is completed. Lastly, filter; returning to the filter the first portions if cloudy.

Special formulæ are given by the author for each kind of medicated water, with the proportions of the ingredients to be used.

Syrup of Iodide of Iron. P. Wells. (*Pharm. Journ.*, 3rd series, xiv. 82.) The author found that glycerin will preserve a solution of ferrous iodide, but on mixing it with syrup the usual difficulties are met with. To overcome these, he now adds about an equal bulk of glycerin to the aqueous solution of the salt, heats to 212° F., and filters into the requisite quantity of cold glucose syrup. After stirring with an iron spatula the mixture will be turbid for about an hour, but afterwards becomes bright and of a very pale green colour, and remains unaffected by time or temperature.

The Testing of Honey. O. Hehner. (*Analyst*, 1884, 64.) Take moisture and glucose before and after inversion, the former should not be above 23 per cent., the sugar should not be sensibly greater after inversion than before.

Ferment a 10 per cent. solution, take the solid matter **after** fermentation, and subtract from it the percentage of glucose **left** unfermented. The proportion of unfermentable matter should be no larger than would be yielded by a pure glucose solution **after** fermentation, namely, about 5 p.c.

Observe polarising power of a 10 per cent. solution both **before** and after fermentation. It should be practically *nil*. **Lævo-rotation** indicates that the honey has become crystalline in the comb; **dextro-rotation** which is diminished, but not removed, that there is **starch-sugar**.

Test with alcohol and barium chloride: neither should give any notable amount of precipitate.

Cantharidin and its Uses. E. Dietrich. (*New Remedies*, August, 1883, from *Pharm. Zeitschr. für Russland*.) The author advocates the abandonment of cantharides as an ingredient in blistering tissues, and the employment in its place of the active principle, **cantharidin**.

The best solvent for this principle is formic acid, which *itself* occurs in cantharides; the stronger the acid the greater is its solvent action.

If cantharidin is to be dissolved in collodion, oil, or the mass of the plaster, it is advisable to rub it first to a very smooth paste with oil. In this shape it is soluble in collodion by mere shaking; in oil and plaster it dissolves on being heated for half an hour to 80° C. (176° F.).

Cantharidal Collodium.

Cantharidin	$\frac{1}{10}$ gr.
Collodion	15 grs.
Rape Oil (as colouring)	$\frac{3}{4}$ gr.

Ordinary Cantharidal Plaster.

Cantharidin	$\frac{1}{8}$ gr.
Suet	3 grs.
Yellow Wax	12 grs.
Turpentine	3 grs.

Perpetual Cantharidal Plaster.

Cantharidin	$\frac{1}{4}$ gr.
Resin	10 grs.
Yellow Wax	8 grs.
Turpentine	5 grs.
Suet	3 grs.
Euphorbium, powd.	1 gr.

Cantharidal Oil.

Cantharidin	.	.	.	.	.	.	$\frac{1}{10}$ gr.
Rape Oil	.	.	.	.	.	.	15 grs.

Cantharidal Ointment.

Cantharidin	$\frac{1}{2}$ gr.
Yellow Wax	.	.	.	.	.	.	45 grs.
Olive Oil	.	.	.	.	.	.	100 grs.

Unguentum Acre.

Cantharidin	.	.	.	.	.	.	$\frac{1}{4}$ gr.
Yellow Wax	.	.	.	.	.	.	$1\frac{1}{2}$ gr.
Resin	.	.	.	.	.	.	8 grs.
Turpentine	.	.	.	.	.	.	6 grs.
Lard	.	.	.	.	.	.	20 grs.
Euphorbium, powd.	.	.	.	.	.	.	1 gr.

In all these cases the relation of cantharidin to Spanish flies is ample, about 1 to 200. In the case of some preparations, as the oil and ointment, loss is occasioned by heat, but this loss is made up by a proportionately larger quantity.

Valuation of Isinglass. F. Prollius. (*Pharmaceut. Central-halle*, xxiv. 335.) The quality of the isinglass may be judged from its proportions of ash, moisture, and insoluble matter, from the viscosity of its solution, and from the results of a microscopic examination. The ash varies in good samples from 0.18 to 1.2 per cent., and in inferior ones up to 3.2; the moisture from 16 to 19 per cent.; and the matter insoluble in boiling water, 0.4 to 3.0 per cent. in good qualities, and up to 21 per cent. in poor ones. In order to estimate the viscosity, 1 part of the sample is heated with 50 parts of water for an hour, the solution made up with water to 90 parts, then strained, and now tested in the viscosimeter. In the case of good samples, 25 c.c. will be found to require from 6 to 8½ minutes to run entirely out of the instrument. For the purpose of a microscopic examination, the sample should be softened in water for two days.

Pepsin. A. Tsheppe. (*New Remedies*, August, 1883.) The author gives a critical view of the chief processes for the preparation of pepsin, and adds the following physiological deductions:—

For the purpose of testing the solvent power of pepsins for albumen, the most favourable conditions were determined, and it was found that pepsin without acid does not dissolve albumen at all; but that the addition of hydrochloric acid containing 0.5 to 0.6 per cent. of absolute acid for temperatures of 38–40° C.,

and a less addition, viz. of 0.2-0.3, of the same acid for higher temperatures, 40-50°C., favours the strongest effect of the pepsin. Somewhat weaker is the action of phosphoric, nitric, and sulphuric acids; with lactic acid and the other organic acids, the effect is diminished. Metallic salts and antiseptics, possessing no coagulating effect upon albumen, do not disturb this process of solution.

Temperature higher than the normal temperature of the human body, and a percentage of acid larger than is met with in the human stomach, may be permitted as proper conditions for the artificial production of peptones, or for the comparison of the effect of different kinds of pepsin; but for demonstrating the amount of solvent power of a pepsin for therapeutical purposes, it would be necessary to establish the identical conditions actually existing in the human organism, and, under these conditions, the co-efficients of solvent power usually claimed for pepsins are far too high. Besides, for the practical preparation of meat peptones, the experimental results gained in this manner have been proven to be illusions, because the yield of meat peptone represents only a small fraction of the albuminoid substance contained in the muscular substance employed.

Pepsin, as well as all other similar ferments which represent products of a continuous physiological function, possesses one great drawback which cannot be removed. We have invariably at our disposal only that quantity of the pepsin-ferment which the stomach of a slaughtered animal at a certain time either has secreted or prepared in cells. It is questionable, therefore, if the therapeutic employment of this ferment has any advantage at all when given to assist the process of digestion in a dyspeptic stomach, and it is doubtful how much in the cases mostly benefited by the use of the pepsin has to be ascribed to the effect of the latter, and how much to the hydrochloric acid accompanying it.

According to the investigations on the amount of digestive fluid in individuals who, on account of a gastric fistula were proper subjects for these experiments, this quantity proved to be (in the human organism) 2 kilograms calculated for twenty-four hours. Although the demands on digestion made by the stomach of the hog are totally different, the conditions of the secretion of pepsin are similar to those in man; and the quantity of pepsin which can be obtained at a definite time from a single stomach, even though more could be obtained from that of a hog than from that of a man, would, on account of the loss, represent at most a *single dose*.

But experience teaches that from a good stomach the manufac-

turer in a favourable case may obtain 4-5 ounces of this saccharated pepsin of the strength as formerly in vogue, viz., $\frac{1}{12}$.

This quantity, according to the method usually employed, was dispensed in one hundred and twenty-five doses of 10 grains each, or in two hundred and fifty doses of 5 grains each. Calculating now the solvent power of the pepsin, we find that 10 grains of pepsin, according to the former statements, could dissolve 120 grains of boiled albumen. For the digestion of 2 ounces of beef-steak there would be necessary, therefore, 80 grains of pepsin, and for that of $\frac{1}{2}$ pound even 320 grains. To-day, the strength of the preparations of pepsin in the market is far greater; but it must not be forgotten that, hand in hand with the methods of preparation, those of the tests have also improved. The U. S. Pharmacopœia demands that 1 grain of pepsin should dissolve 50 grains of boiled albumen; in the case above mentioned, viz., for the digestion of $\frac{1}{2}$ pound of beefsteak, even of this digestive preparation 80 grains would be necessary to effect solution. The author has found that of Jensen's pepsin, only the 500th part would be necessary for the same purpose; and 1 ounce of a protein-substance, therefore, would demand 1 grain of this pepsin only; but as mentioned above, even in the best preparations the percentage of peptones obtained during the process from those really present is a very limited one, and the general objection made above is not answered even by the fact that very active pepsin preparations are actually obtained.

The logical deduction, therefore, from these observations would be, that the small doses of pepsin of feeble digestive power should be replaced by very much larger doses of those preparations of pepsin which are recognised as the best, whenever any practical results are to be expected and looked for; that all favourable conditions which are known experimentally to produce a rapid and perfect solution of the albuminoids should never be lost sight of when the remedy is employed for medicinal purposes, and that this effect ceases when pepsin is administered either simultaneously with or in combination with alkalis, a rule which, in spite of frequent warning, is up to this day still disregarded by many.

The Medicinal Uses and Value of Naphthol. J. V. Shoemaker. (*Therapeutic Gazette*, Nov., 1883.) Naphthol is a derivation of naphthalene, a hydrocarbon found in large quantities in coal tar, belonging to the so-called aromatic group. It bears the same relation to naphthaline that phenol does to benzol, and cresol to toluol. It was first employed by Professor Kaposi as a substitute

for tar in skin diseases, being considered by him as the essential curative ingredient of that substance, while being free from its objectionable features. The preparation employed in the cases which form the basis of the author's report was that made after the method of Dr. Justus Wolf, being free from odour and coming in beautiful crystalline scales. This preparation decomposes under the influence of heat, when it again becomes odorous and pungent. The commercial naphthol contains impurities which unfit it for use in medicine. Naphthol thus properly purified is an extremely powerful antiseptic and disinfectant. One part added to 480 of urine kept the latter from decomposing for six months, while another sample of the same urine, to which naphthol was not added, had a strong putrid odour at the end of eight days. The addition of the naphthol to this putrid sample divested it of all odour within twenty-eight hours.

The author's therapeutic experiments extended through some nine months, and sufficed to convince him of the great value of naphthol in medicine.

He found it to fully sustain the claim that Kaposi had made for it in scabies, psoriasis, and chromophytosis, as well as in some of the chronic forms of eczema, in which it not only allayed the itching attendant thereon, but lessened the infiltration as well. In wounds and indolent ulcers it is a most useful detergent and deodorant, removing the fetor and establishing healthy action of the parts. Aqueous solutions, containing half grain to the ounce, were used to great advantage as vaginal injections, especially in leucorrhoea and uterine carcinoma, as well as in gonorrhoeal affections, both in male and female. In diphtheritic throat affections it made a most useful gargle, as well as to remove the fetor of catarrhal and other affections of the buccal cavity. Its greatest value, however, arose from its disinfectant action on the evacuations of fever patients and in rooms containing them, while by its absence of odour it did not tend to produce inconvenience either to patient or attendants. Combined with powdered talcum or starch, or both, and dusted into the shoes or stockings of those affected with fetid exhalations of the feet, it acts most satisfactorily, and its effects are equally as good in the same affection involving the hands, axillary and inguinal regions. Combined with other ointments in the proportion of from one to ten grains to the ounce, it not alone preserves the ungent from decomposition, but exercises also an antiseptic action on the parts and the exudation therefrom. A slight admixture to an experimental sample of lard preserved the same in excel-

lent condition throughout the hot summer months. In chronic psoriasis, particularly when there is great infiltration, a five to fifteen per cent. ointment was frequently attended with good results. It also proved very effective in squamous and fissured eczema, used in combination with lard or gelatin.

After his long and successful employment of naphthol, the author was surprised to find that serious untoward effects had been reported from its use by foreign authors. With a view to further testing its toxic properties, he first administered it to a rabbit internally in a saturated solution. But on discovering no injurious effect, he selected another rabbit, which he determined to poison with a view to observing the *post-mortem* appearances. He accordingly gave it at first one-grain pills of naphthol every three hours, and subsequently increased the amount to two grains and again to four grains at the same intervals. But beyond increasing the animal's appetite no effects were apparent. Following these experiments, two of his assistants took numerous and large doses (reaching as high as five grains twice a day), without other effect than a sensation of temporary warmth in the epigastric region after each dose, and subsequent slight vertigo and buzzing of the ears, with other evidence of hyperæmia. The alvine evacuations were softened to a mushy consistence and changed to a clay colour; in one instance diarrhoea occurred. The deduction from these experiments clearly is, that in the case of the ill-effects reported an impure preparation had been employed.

The author pronounces purified naphthol to be far superior to carbolic acid and the other antiseptics which have been in vogue, while it is almost absolutely odourless. It has the advantage also of being cheaper than carbolic acid, when the amount required to produce its effect is considered.

The Use of Petrolatum in the Official Ointments. J. P. Remington. (*Amer. Journ. Pharm.*, 1883, 487.) With a view of obtaining some experience in the general use of this new ointment base, the following series of formulæ was devised, in which petrolatum was substituted for lard and other animal fat in each of the official cerates and ointments of the United States Pharmacopœia. In the author's opinion the next revision of this work will probably require the use of this base in most of the official ointments. All the formulæ here given are said to yield very satisfactory results.

Ceratum.—Yellow wax, 30 parts; petrolatum, 70 parts. Melt them together and stir constantly until cool. The cerate made in this way is of a light yellow colour and, of course, would not be

recognised as officinal simple cerate; it is nevertheless an excellent dressing, and will retain its properties unimpaired a greater length of time than officinal cerate.

Ceratum Camphoræ.—Camphor liniment, 3 parts; olive oil, 12 parts; cerate (made with petrolatum), 85 parts. Mix the camphor liniment and the olive oil, and incorporate with the cerate. This cerate was introduced as the base of cerate of sub-acetate of lead, and when made from petrolatum is more permanent than the officinal. A better and simpler formula, in some respects, is as follows: Powdered camphor, 1 part; petrolatum, 10 parts; cerate (made from petrolatum), 189 parts. Warm the petrolatum until it liquefies, then dissolve the camphor in it, and incorporate with the cerate.

Ceratum Cantharidis.—Cantharides, in No. 60 powder, 35 parts; yellow wax, 20 parts; resin, 20 parts; petrolatum, 25 parts. Use the officinal process.

Ceratum Cetacei.—Spermaceti, 10 parts; yellow wax, 25 parts; petrolatum, 65 parts. Melt together the spermaceti and wax, then add the petrolatum and stir the mixture constantly until cool. Not white, but much more permanent than the officinal.

Ceratum Extracti Cantharidis.—Cantharides, in No. 60 powder, 30 parts; resin, 15 parts; yellow wax, 35 parts; petrolatum, 35 parts; alcohol, a sufficient quantity. Use the officinal process.

Ceratum Plumbi Subacetatis.—Solution of subacetate of lead, 20 parts; camphor cerate (made from petrolatum), 80 parts. Mix them thoroughly. This cerate is more permanent than the officinal and, in practice, will be found to be very efficient in alleviating acute, active, cutaneous inflammation, at times being successful when the officinal ointment does not afford immediate relief. It is yellowish white in colour.

Ceratum Resinæ.—Resin, 35 parts; yellow wax, 15 parts; petrolatum, 50 parts. Melt together at a moderate heat, strain through muslin, and allow it to cool without stirring. The substitution of petrolatum in this cerate is probably not much of an improvement from a therapeutic point of view, as stimulation is the object sought; it would, however, not be objectionable. When made without stirring, a semi-translucent handsome ointment is produced.

Ceratum Sabinæ.—Fluid extract of savine, 25 parts; resin cerate (made from petrolatum), 90 parts. Use the officinal process.

Unguentum.—Petrolatum, 80 parts; yellow wax, 20 parts. Melt the wax and add the petrolatum gradually, then stir the mixture

constantly until cool. A yellowish white ointment, which is firmer in consistence than the petrolatum, having the higher melting point. It is well adapted for use in the firmer class of medicated ointments.

Unguentum Acidi Carbolici.—Carbolic acid, 10 parts; ointment (made from petrolatum), 90 parts. Mix them thoroughly. This ointment seems to have less tendency to separate than that made by the official process; therapeutically there can be but little difference in them.

Unguentum Acidi Gallici.—Gallic acid, 10 parts; benzoinated petrolatum, 90 parts. Use the official process. Very little benefit was observed when petrolatum was treated with benzoin; the peculiar change in the odour of petrolatum which occurs when it is long kept has been observed in benzoinated petrolatum almost to as great an extent as in simple petrolatum which was exposed for the same length of time. The odour is undoubtedly modified by the presence of the benzoin, but the petrolatum is not changed or protected by it. This ointment is undoubtedly an improvement on the official one.

Unguentum Acidi Tannici.—Tannic acid, 10 parts; benzoinated petrolatum, 90 parts. Use the official process. This is a better ointment, therapeutically, than the official.

Unguentum Aqua Rosæ.—Petrolatum, 60 parts; white wax, 10 parts; rose water, 30 parts. Use the official process. The addition of a small quantity of oil of rose improves this ointment greatly. Although it would be probably useless to attempt to dispense this improved ointment, in ordinary counter practice, as cold cream, because of its yellowish colour, there is no question of the superiority of the petrolatum cold cream as a practical dressing and emollient.

Unguentum Belladonnæ.—Alcoholic extract of belladonna, 10 parts; diluted alcohol, 6 parts; petrolatum, 84 parts. Rub the extract with the diluted alcohol until uniformly soft, gradually add the petrolatum, and mix thoroughly. An improvement over the official ointment therapeutically.

Unguentum Chrysarobini.—Chrysarobin, 10 parts; petrolatum, 90 parts. Rub the chrysarobin with the petrolatum, gradually added, until they are thoroughly mixed. A better ointment may be made, however, by digesting the mixture in a water-bath, and stirring thoroughly as it cools.

Unguentum Diachylon.—Lead plaster, 60 parts; petrolatum, 39 parts; oil of lavender, 1 part. Melt together the lead plaster and

petrolatum at a moderate heat ; then, having permitted the mass to become partly cool, incorporate with it the oil of lavender, and stir constantly until cold. This ointment is a decided improvement on the official formula ; it keeps much better, does not separate, and is not so adhesive. On account of the want of uniformity in the quality of olive oil permitted by the Pharmacopœia, physicians often complain of the irritant effects produced by the use of this ointment as ordinarily dispensed. The use of petrolatum would undoubtedly do away with these difficulties, and a smooth, non-irritating, and more permanent ointment than the official be produced.

Unguentum Gallicæ.—Nutmeg, in No. 80 powder, 10 parts ; petrolatum, 90 parts. Rub the nutmeg with the petrolatum, gradually added, until they are thoroughly mixed. For therapeutical reasons this is preferable to the official.

Unguentum Hydrargyri.—Mercury, 450 parts ; petrolatum, 300 parts ; yellow wax, 150 parts ; compound tincture of benzoin, 40 parts ; mercurial ointment, 100 parts. Mix the mercury with the tincture of benzoin in a mortar, add the mercurial ointment (which should contain fifty per cent. of mercury) ; and triturate the mixture until globules of mercury cease to be visible ; then add the petrolatum and yellow wax, previously melted together and partially cooled, and continue the trituration until globules of mercury cease to be visible under a magnifying power of ten diameters. This is believed to be a better ointment than the official, for both lard and suet are dispensed with, the necessary firmness being imparted by yellow wax ; the process is practically more rapid than the official, because suet is almost granular in its character, and prolonged trituration is necessary to break down the granules ; the disagreeable odour always present in suet, is of course absent in the improved preparation, whilst rancidity is effectually prevented.

Unguentum Hydrargyri Ammoniati.—Ammoniated mercury, in very fine powder, 10 parts ; petrolatum, 90 parts. Rub the ammoniated mercury with the petrolatum, gradually added, until they are thoroughly mixed. Preferred for therapeutical reasons.

Unguentum Hydrargyri Nitratis.—The practice which has been indulged in to some extent of making citrine ointment from petrolatum is one which should be condemned. The well-recognised therapeutic effects caused by the use of this ointment are probably due not only to the presence of the acid nitrate of mercury, but to the elaidin produced by the action of nitric acid upon olein. Now it has been shown by Schorlemmer that hot nitric acid attacks octane, one of the higher members of the paraffin group, and that

succinic acid is one of the products; but it is yet to be proved that the resulting compounds, if any, produced by reacting upon petrolatum with nitric acid, under the circumstances detailed by the officinal process, are valuable. Indeed, it is very probable that the chemical changes are slight, and it is very fair to assume that totally different products must result when a mixture of paraffins is treated with nitric acid, than when the olein in an animal oil is so treated.

Practical results seem to verify this view, for the attempts to produce ointment of nitrate of mercury from petrolatum, which have been made by various investigators from time to time, have proved failures, a spongy yellowish mass, filled with bubbles of gases resulting from decomposition, and ultimately turning brown, is the result. The present officinal process, if strictly adhered to, gives an excellent product, and, for the reasons above given, the writer recommends it in preference to all others.

Unguentum Hydrargyri Oxidi Flavi.—Yellow oxide of mercury, in very fine powder, 10 parts; ointment (made from petrolatum, see unguentum), 90 parts. Rub the oxide of mercury with the ointment, gradually added, until they are thoroughly mixed. Preferred to the officinal for therapeutical reasons.

Unguentum Hydrargyri Oxidi Rubri.—Red oxide of mercury, in very fine powder, 10 parts; ointment (made from petrolatum, see unguentum), 90 parts. Rub the oxide of mercury with a small quantity of the ointment until a perfectly smooth mixture is obtained; then gradually add the remainder of the ointment, and mix thoroughly. More permanent than the officinal, and preferable therapeutically.

Unguentum Iodi.—Iodine, 4 parts; iodide of potassium, 1 part; water, 2 parts; petrolatum, 93 parts; use the officinal process. A dark greenish black ointment is produced, which is probably not inferior to the officinal. The advantages of the use of petrolatum here are not so apparent as in some of the other ointments.

Unguentum Iodoformi.—Iodoform, in very fine powder, 10 parts; petrolatum, 90 parts. Rub the iodoform with the petrolatum, gradually added, until they are thoroughly mixed. Preferable on therapeutic grounds.

Unguentum Mezerei.—Fluid extract of mezereum, 25 parts; petrolatum, 80 parts; yellow wax, 12 parts. Melt together the petrolatum and wax with a moderate heat, add the fluid extract, and stir the mixture constantly until the alcohol has evaporated, then continue to stir until cool. The advantages of petrolatum in

this ointment over lard are not very apparent, as it is used as a stimulating application.

Unguentum Picis Liquidæ.—The use of petrolatum here is not recommended, although if desirable a mixture of yellow wax and petrolatum of the consistence of suet could be used.

Unguentum Plumbi Carbonatis.—Carbonate of lead, in very fine powder, 10 parts; petrolatum, 90 parts. Rub the carbonate of lead with the petrolatum, gradually added, until they are thoroughly mixed. Preferable therapeutically to the officinal.

Unguentum Plumbi Iodidi.—Iodide of lead, in very fine powder, 10 parts; petrolatum, 90 parts. Rub the iodide of lead with the petrolatum, gradually added, until they are thoroughly mixed. A bright orange-coloured ointment, which darkens on the surface when exposed.

Unguentum Potassii Iodidi.—Iodide of potassium, in fine powder, 12 parts; hyposulphide of sodium, 1 part; boiling water, 6 parts; petrolatum, 81 parts. Dissolve the iodide of potassium and the hyposulphite of sodium in the boiling water in a warm mortar; then gradually add the petrolatum and mix thoroughly. This ointment is of a lemon-yellow colour, but shows a disposition to separate on keeping, due to the presence of the water; it should only be made as it is needed.

Unguentum Stramonii.—Extract of stramonium, ten parts; water, five parts; petrolatum, eighty-five parts. Rub the extract with the water until uniformly soft, then gradually add the petrolatum, and mix thoroughly. Very much preferable to the officinal in the treatment of hæmorrhoids.

Unguentum Sulphuris.—Sublimed sulphur, thirty parts; petrolatum, seventy parts. Rub the sulphur with the petrolatum, gradually added, until they are thoroughly mixed. Probably no better than the officinal.

Unguentum Sulphuris Alkalinum.—Washed sulphur, twenty parts; carbonate of potassium, ten parts; water, five parts; petrolatum, sixty-five parts. Rub the sulphur with the carbonate of potassium and the water, gradually add the petrolatum, and mix thoroughly. Preferable on therapeutic grounds to the officinal.

Unguentum Veratrinx.—Veratrine, four parts; alcohol, six parts; petrolatum, ninety-six parts. Rub the veratrine with the alcohol in a warm mortar until dissolved, then gradually add the petrolatum and mix thoroughly. This ointment is much darker in colour than the ointment formerly officinal, due to the complete solution of the veratrine. When made from petrolatum it is probably more

efficient than when made from lard, because of its more rapid absorption.

Unguentum Zinci Oxidi.—Oxide of zinc, twenty parts; petrolatum, eighty parts. Rub the oxide of zinc with twenty parts of petrolatum previously melted, until the mixture is perfectly smooth; then add the remainder of the petrolatum, and mix thoroughly. This ointment does not equal the officinal in appearance; it is not white, nor does it have the pleasant balsamic odour due to the benzoin; but when used to allay irritation, as in acute eczema, the ointment made from petrolatum will frequently be preferred.

Unguentum Hydrargyri Nitratis. C. W. Reichard. (Abstract of an inaugural essay. *Amer. Journ. Pharm.*, 1883, 438.) The author made a series of experiments, following the process of the Pharmacopœia for 1880, but using different kinds of fats. 76 parts of the fat were heated to 70°C., when 7 parts of nitric acid, of the proper strength, were added without stirring, but continuing the heat as long as a moderate effervescence took place; when nearly cool, the warm solution of 7 parts of mercury in 10 parts of nitric acid was added, and stirred. In each case the degree or absence of effervescence, change of colour, and other changes, were noted, as were also the colour, odour, and consistence of the preparation as soon as it had become cold, about an hour after the mercury solution had been added to the fat. Similar observations were afterwards made at regular intervals. The fats used were: (1) castor oil, (2) neats' foot oil, (3) linseed oil, (4) vaseline, (5) cosmoline, (6) oleic acid, (7) sweet almond oil, (8) lard oil, (9) cotton-seed oil, (10) lard, (11) lard and lard oil, (12) lard and cotton-seed oil, (13) lard oil and sweet almond oil, (14) castor oil and sweet almond oil, and (15) butter. The author has tabulated his results (see table next page).

It is the author's opinion that the present base for citrine ointment, lard oil, though not perfect in all respects, has the fewest objectionable features, and that its adoption is a decided step toward perfection.

Incompatibility of Quinine and Iodide of Potassium. M. Rabuteau. (*Amer. Journ. Pharm.*, 1884, 340.) In a communication to the Biological Society, the author calls attention to the ill effects of iodide of potassium and sulphate of quinine when administered together or at short intervals. These effects are, on the part of the digestive organs, anorexia, nausea, epigastric pain, colic, and sometimes vomiting; on the part of the general system, *malaise*, slowing and feebleness of the pulse, pallor, and a sense of fatigue. These

U

No. of preparation.	Freshly prepared.			After two weeks.			After two months.		
	Colour.	Odour.	Consistence.	Colour.	Odour.	Consistence.	Colour.	Odour.	Consistence.
1.	Pale yellow	Strongly rancid	Stringy	Yellow-green	Less rank	Waxy	Pale green	Very slightly rank.	Waxy
2.	Slightly brown yellow	Slight	Syrupy	Pale yolk-yellow	Less strong	Good	Light yellow	Slight	Slightly firmer
3.	Brown, dark-red	None	Liquid	Same	Same	Same	Same	Same	Same
4.	Light brown	None	Granular and spongy	Same	Same	Same	Same	Same	Same
5.	Light brown	None	Granular and spongy	Same	Same	Same	Same	Same	Same
6.	Red-yellow	None	Liquid	Red-yellow	Same	Spongy, semi-liquid	Same	None	Good
7.	Light yolk-yellow	None	Butter-like, smooth	Lighter	Same	Firmer	Very light	None	Very firm
8.	Yellow	Slight	Good	Bright yellow	Slight	Good	Same	None	Good
9.	Red yellow	Lard-like	Soft	Red-yellow	Lard-like	Soft and sticky	Very dark	Slight	Soft and sticky
10.	Light	None	Good	Lighter	None	Hard	Same	None	Too hard
11.	Light yellow	Slight	Good	Not changed	None	Firm	Not changed	None	Too hard
12.	Light brown	None	Hard	Light brown	None	Hard	Unchanged	None	Hard
13.	Light yellow	Slight	Good	Unchanged	Rank and disagreeable	Good	Unchanged	Rank and disagreeable	Good
14.	Light yellow	Slight	Good	Unchanged	Rank and disagreeable	Good	Unchanged	Rank and disagreeable	Good
15.	Light yellow	Slight	Good	Unchanged	Changing	Good	Unchanged	Rank and disagreeable	Soft

results are due to the decomposition of the iodide and the liberation of free iodine. This decomposition takes place, not alone in the stomach, but goes on in the intestine also. The same result occurs from the use of an iodide sophisticated with an iodate of potassium. Iodine is set free, and to the action of this is to be referred the local and systematic effects above mentioned.

NOTES AND FORMULÆ.

PART III.

NOTES AND FORMULÆ.

Purification of Potable Water. Prof. Almén. (*Zeitschr. des oesterr. Apoth. Ver.*, 1884, 295.) The author recommends the purification of potable water by the addition of ferric chloride and lime, and is supported in this suggestion by Prof. Husemann. To each litre of the water 3 c.c. of a 5 per cent. ferric chloride solution are added, and afterwards about 50 c.c. of lime water (the quantity of the latter should vary according to the hardness of the water). The precipitate thus formed is allowed to settle, and the water further cleared by filtration. From 40 to 80 per cent. of the organic matter present are thus removed along with the iron precipitate.

The Toxic Action of Copper. MM. Houlès and De Pietra Santa. (*Louisville Medical News*, March 15, 1884.) It seems to grow more and more doubtful whether copper can be reckoned among the poisonous metals. Of course in large quantities it is noxious; but this is true of alcohol and of many other compounds which cannot fairly be considered as poisonous. The latest experiments tend to indicate that at any rate it is not a cumulative poison, like lead. The authors, in a recent communication addressed to the Académie des Sciences, of Paris, report that they have been unable to discover any injurious action on the health of the workmen engaged in the copper industry, and have come to the conclusion that the so-called "*colique de cuivre*," asserted in the eighteenth century to be a definite disease, does not exist.

The Relative Value of Ether and Chloroform as Anæsthetics. J. W. Parkinson. (*Amer. Journ. Pharm.*, 1884, 293.) The author arrives at the following conclusions:—

1. That ether is as efficient an anæsthetic as chloroform.
2. That there are few cases in which its use is contra-indicated.
3. That it is a safer anæsthetic in the hands of the most experienced, and by inference corresponding in an increased ratio with those more or less unskilled.

4. That the use of chloroform in preference to ether, where no contra-indication to the latter can be shown, is adding materially to the risk of the patient and the responsibility of the administrator.

Paraldehyde, the New Hypnotic. (*Med. and Surg. Rep.*, November 17, 1883.) This agent promises to be an important addition to the sleep-producing remedies. Paraldehyde is a polymeric modification of aldehyde, and is expressed by the formula $C_6H_{12}O_3$. It is colourless; in odour resembling chloroform, with a sharp taste. It is administered in doses of 2-6 grams, preferably in a sweetened ten per cent. solution. Its immediate effect is to produce a perfectly natural sleep of two to six hours' duration, from which the subject awakes without any sense of distress, headache, dulness, or nausea. Its signal advantage over chloral hydrate is that it does not weaken the heart's action, nor impede the respiration or circulation in any degree; nor does it establish the necessity for its continued use, thus forming a "habit."

The sole objection to paraldehyde seems to be that it gives an unpleasant odour to the breath, which not only is noticeable in the room, but remains for twenty-four hours.

The experiments upon it up to the present have chiefly been reported from the hospitals of Milan, Breslau, and Andernach.

Relative Antiseptic Power of Some Chemical Substances towards Bacteria. M. Miquel. (*Centralbl. für Allg. Gesundheitspflege. From Chem. and Drugg.*) The author gives the following table of the relative antiseptic powers of some chemicals, the proportion given being the quantity of the substance in question which is capable of preventing fermentation and putrefaction of 1 litre of beef-tea:—

	G.
Mercurous Iodide	0.025
Argentous Iodide	0.03
Hydrogen Peroxide	0.05
Mercuric Chloride	0.07
Silver Nitrate	0.08
Osmic Acid	0.15
Chromic Acid	0.20
Iodine	0.25
Chlorine Gas	0.25
Prussic Acid	0.40
Bromine	0.60
Chloroform	0.80
Copper Sulphate	0.90
Salicylic Acid	1.00

	G.
Benzoic Acid	1·10
Potassium Chromate	1·30
Picric Acid	1·30
Plumbous Chloride	2·10
Mineral Acids	2·00-3·00
Essence of Bitter Almonds	3·20
Carbolic Acid	3·20
Potassium Permanganate	3·50
Aniline.	4·00
Alum	4·50
Tannic Acid.	4·80
Arsenious Acid	6·00
Boric Acid	7·50
Chloral Hydrate	9·50
Iron Sulphate	11·00
Amylic Alcohol	14·00
Ether	22·00
Borax	70·00
Alcohol	95·00
Potassium Sulphocyanide	120·00
Potassium Iodide	140·00
„ Cyanide	185·00
Sodium Hyposulphite	275·00

Iodine as an Antidote for Snake Bite. Dr. G. H. Carpenter. (*Med. and Surg. Reporter*.) The author states that he has secured excellent results in two cases of poisoning by the bite of the copper-head, from the internal administration of tinct. iodinii comp., fifteen drops in a third of a glass of water, and the local application of the tincture of iodine to the bitten limb or part.

Hyoscyamine for Hypodermic Use. T. Browne. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 545.) The author recommends the following formula:—

Crystallized Hyoscyamine	4 grains.
Glycerin,	
Distilled Water, of each	$\frac{1}{2}$ ounce.
Carbolic Acid	2 minims.

Four to eight minims of this solution are used for each injection. The preparation must be made cold, as the alkaloid is liable to suffer decomposition on heating. It does not keep more than a month without change.

Traumaticine. R. Modlen. (*Pharm. Journ.*, 3rd series, xiv. 341.) Traumaticine is the name of a preparation recommended by the author in preference to medicated gelatin as an application in skin diseases, and consists of a solution of 1 part of gutta-percha

in 10 parts of chloroform. This forms an admirable adhesive, and continues unchanged and adherent to the skin for some days. It produces a very thin, delicate film, causes neither tension nor pain, as gelatine does, is very readily applied, and, as may be inferred from its composition, is quite permanent, whereas the gelatine becomes mouldy. At the Radcliffe Infirmary, Oxford, it has been used by H. P. Symonds with great success in psoriasis. In making it, the author uses the gutta percha tissue, which answers the purpose quite as well as the purified gutta percha. In appearance it is a thick fluid, of a purplish colour. In preparing it with any medicament, *e.g.*, acidum chrysophanicum, the author dissolves the acid, etc., in the chloroform, before adding the gutta percha.

Pheno-Resorcin. F. Reverdin. (*La Ruche Pharm.*) This name has been given by the author to a mixture prepared by melting together,—

Carbolic Acid	67 parts.
Resorcin	83 „

and finally adding 10 parts of water. It then remains liquid, and has the advantage of being soluble in water *in all proportions*. The two substances are analogous in properties, and may therefore well be combined.

Antibacterie. C. Aschmann. (*Dingl. polyt. Journ.*, celi. 143.) For the preparation of this antiseptic compound, the author heats 338 parts of borax with 198 of glucose, in the presence of a small amount of water. When the fusion is complete, he adds 124 parts of boric acid, whilst constantly stirring, until it has been dissolved, and causes the liquor to evaporate at a gentle heat until a sample of it solidifies when run on a cold plate. The resulting mass is soft and translucent, forming an antiseptic suitable for the preservation of provisions. Its composition is represented by the formula $C_6H_{12}O_6, Na_2B_4O_7, 3H_3BO_3$.

Use of Boric Acid for Preserving Food. J. Forster. (*Dingl. polyt. Journ.*, celi. 170.) From a series of experiments made with a view to determine the action of boric acid on the animal system, the author draws the following conclusions:—The admission of boric acid as addition to food, even in very small doses, is injurious to the digestive organs. This injurious action depends on the circumstance that boric acid acts so as to materially increase the proportion of solid matters and nitrogen in the fæces separated. It is also a very remarkable coincidence that the action of boric acid on the intestinal discharge is well marked, even by the exhibition of as little as 0.5 gram per diem. Moreover, this action

is in direct relation to the quantity of acid taken, and is maintained for some time after the doses of acid have ceased. The action described is perceptible, not only with vegetable or animal foods which contain a large proportion of indigestible ingredients, but also when highly digestible food, such as milk and eggs, is taken. Food to which boric acid has been added tends to cause an increase in the secretion of gall during assimilation. Its most important action, however, is the increase which it causes in the discharge of albuminous substances from the intestinal canal. From this it is evident that its use as a food preservative is not as beneficial as hitherto assumed.

Koussinate of Soda. (*Pharmaceutical Record*, May 15, 1884.) One of the most efficient combinations of koussin is that with soda, which is effected as follows:—Any desirable quantity of koussin is dissolved in hot water, to which enough bicarbonate of soda is added to dissolve the koussin entirely; boil this solution with a little animal charcoal for a few seconds, and then filter. The solution thus obtained, and which though slightly coloured is clear, is now slowly evaporated in a porcelain dish until dry. The koussinate of soda is an amorphous, powder-like mass, of intensely bitter taste and whitish colour, slightly bordering on yellow, somewhat hygroscopic, soluble in cold water, but more so in warm. It is equally soluble in alcohol, excepting the slight excess of carbonate of soda. On account of this great solubility, it can be dispensed in all forms, and it is said to have done splendid service in the treatment of tænia and pin worms.

Hippurate of Soda. P. Boa. (*Pharm. Journ.*, 3rd series, xiv. 506.) There are only two forms in which this preparation is likely to be dispensed, viz., in the form of powders and of mixtures.

(1) *Powders.*—The hippurate of soda itself, dispensed in powder form, keeps quite well in paper. Combinations of the salt with lithia carbonate and citrate and bicarbonate of potash and soda, put up in powders in the usual way, and kept for a fortnight, were found on examination to be in as good condition as when prepared.

(2) *Mixtures.*—Like all alkaline salts, the taste of hippurate of soda is disagreeably saline. The author has tried a number of combinations, with the object of rendering its administration as pleasant as possible, and the results may be briefly stated:

Chloroform water, or spirit of chloroform, seems to make it more disagreeable, rendering it almost nauseous.

Infusion of calumba disguises the saline taste, and where the bitter is not an objection, affords an eligible vehicle.

The most agreeable mixtures, however, are obtained by employing syrup and peppermint water, or glycerine and cinnamon water.

The following examples may suffice :—

I.

R	Sodæ Hippurat.	.	.	.	.	.	gr. 80
	Lithiæ Carb.	.	.	.	.	.	gr. 24
	Glycerin	.	.	.	.	.	5 iv.
	Aq. Cinnam.	.	.	.	.	.	ad 3 viij.

M. Sig. One-eighth part for a dose.

II.

R	Sodæ Hippur.	.	.	.	.	.	3 ij.
	Potass. Citrat.	.	.	.	.	.	5 iij.
	Syrupi	.	.	.	.	.	3 vj.
	Aq. Ment. Pip.	.	.	.	.	.	ad 3 vj.

M. Sig. Tablespoonful for a dose.

The addition of an alkaline carbonate or citrate, as given in the foregoing, is desirable, so as to imitate the condition of the renal excretion of the herbivora, which is alkaline, that of man being usually acid.

The salt is very soluble. Fifty grains dissolve in thirty minims of water, forming a syrupy liquid. The dose may be from ten to fifteen grains.

Pinkos Tubers. (*Pharm. Journ.*, 3rd series, xiv. 974.) Under the name of "pinkos-knollen," a very hard, red, woody substance has lately been introduced into the Vienna market, probably from Australia, which is found to be almost as valuable for turning purposes as ivory. Dr. F. von Höhnelt has subjected this substance to a careful examination, and has determined, from the following characters, that it is the product of a coniferous tree belonging to the family *Araucariæ* :—(1) The absence of true vessels. (2) The absence of resin passages. (3) The extremely thin-walled medullary rays, consisting of a single row of cells, comparatively large, and placed in bulgings of the tracheids. (4) The remarkable pits which indicate the tracheids on the borders of the medullary rays. (5) The large bordered pits of the tracheids, which meet from opposite sides, usually placed in two rows, and then nearly polygonal. (6) The sclerenchymatous pith, from four to five millimetres wide. The so-called "tubers" are turnip-shaped, 15–40 centimetres long and 7–16 broad; broad and apparently broken off at one end, running out into a point at the other end. The transverse section shows a sclerenchymatous pith, 4–5 millimetres wide, surrounded

by a number of very narrow annual rings, the older of which are concentric, the outer ones strongly excentric. They are usually covered by rotten wood and soil, and are probably gigantic knots which have fallen out of decaying and mouldering trunks in the primeval forest. They must be derived from either *Araucaria* or *Dammara*, and very probably from *Araucaria Bidwillii*, the "bunya-bunya pine," a native of New South Wales.

Preparation of Granular Effervescent Salines. J. W. Hurty. (*Chem. and Drugg.*, 1883, 435.) The following serves as the base for the various preparations suggested by the author:—

Sodium Bicarbonate	10 parts
Acid Tartaric	9 "

To this mixture may be added any medicament desired, which is applicable to this method of exhibition, due regard being given to dosage; which dosage should be proportioned to not more than two drachms of the granular mixture. The granular form is produced by simply dampening the thoroughly-mixed dry powders with strong alcohol, and passing it through a No. 10 sieve by rubbing with the hand. For drying use trays made by stretching muslins over frames. These trays, when loaded, are suspended over a gas-stove or placed in bright sunshine.

When dry, oil of lemon may be used to impart an agreeable flavour to the granules. The following formula are given:—

Granular Effervescent Lithium Citrate.

Sodium Bicarbonate	10 parts
Acid Tartaric	9 "
Lithium Citrate	1 "

Granular Effervescent Iron Citrate.

Sodium Bicarbonate	10 parts
Acid Tartaric	9 "
Ammonia Cit. of Iron	1 "

Granular Effervescent Magnesium Citrate.

Sodium Bicarbonate	10 parts
Acid Tartaric	9 "
Magnesium Citrate	6 "

The magnesium citrate, in order that it be quickly and entirely soluble, must be made as follows:—

Take citrate acid 200 grams, dissolve in 600 c.c. boiling distilled water. When perfect solution is effected, add 60 grams

calcined magnesia, and stir continuously until in solution, filter while hot into a shallow dish, and set aside for twenty-four hours. A solid mass will form, which must be allowed to dry at the ordinary temperature, and then powdered in a mortar, and kept in a stoppered bottle. Magnesium citrate made thus is soluble in not more than four parts of water.

Granular Effervescent Citrate of Caffeine.

Sodium Bicarbonate	40 parts
Acid Tartaric	30 "
Citrate of Caffeine	1 "

The bromides, bismuth and ammonium citrate, pepsin, cerium oxalate, and a host of remedies can be prepared in this form.

Process for Preparing Extract of Hops. W. S. Forster. (*Dingl. polyt. Journ.*, ccli. 288.) The author distils hops by means of steam, and recovers the ethereal oils. The residue is extracted with carbon bisulphide, and the extract, after expelling the carbon bisulphide, is neutralised with soda and evaporated in a vacuum. It is then treated with alcohol, filtered, and the residue dissolved in ether. From this solution, the lupulin is separated in the form of an alkaline salt by the addition of potash or soda. After treatment with carbon bisulphide, the hops are distilled with steam to remove the bisulphide; the tannin is then extracted with boiling water, and the extract evaporated. In brewing with these substances, the tannin and lupulin extracts are added to the beer worts before boiling; whilst the hop oil is added after boiling, immediately before the commencement of the fermentation.

Fellow's Syrup of the Hypophosphites. A. Tscheppe. (*Pharm. Rundschau*, March, 1884.) The author publishes an article on this popular medicinal compound. After asserting the inaccuracy of a professed analysis of the syrup, published by A. Gawalowski, of Brünn, the author explains his process of analysis, and concludes by giving the following formula, which, he states, will yield a product in every respect similar to the original:—

Soluble Phosphate or Pyrophosphate of	15 grs.
Iron (U.S.P.)	
Hypophosphite of Sodium	45 "
Sulphate of Quinine	5 "
Strychnine (previously dissolved by itself)	$\frac{1}{2}$ "
Hypophosphite or Sulphate of Manganese	15 "
Thick Syrup to	16 ozs.

The salts are dissolved by gentle heat, but without the addition of acid.

Mistura Carminativa. (*Chem. and Drugg.*, 1884, 290. From the Pharmacopœia of the Victoria Hospital for Children.) Dose for a child one year old :—

Carbonate of Magnesia	2 grains.
Aromatic Spirit of Ammonia	2 minims.
Glycerine	5 "
Saccharated Solution of Lime	3 "
Compound Tincture of Cardamoms	5 "
Water	1 drachm.

Syrup of Tolu. M. Malenfant. (*Journ. de Pharm. et de Chim.*) The author recommends to prepare this syrup in the following manner :—

Tincture of Tolu	250 grm. = 5 fl. 3
Water	6 kilos. = 12 lbs.
Sugar	10 kilos. = 20 lbs.
White of one Egg.	

Beat the white of egg to foam, and mix it with one litre (one quart) of water; then add the tincture of tolu, and pour the whole upon the sugar contained in a boiler. Now add the remainder of the water, and heat it as rapidly as possible to boiling over a fire, without stirring. Finally strain and filter. The brief boiling is necessary to separate the resinous constituents of the balsam.

Amussat's Laxative Syrup. (*Pharm. Centralhalle*, 1883, No 3.)

Guaiaac Wood, rasped	100 grams.
Chicory Root	100 "
Burdock Root	100 "
Peony Root	100 "
Fumitory Herb	100 "
Pansy Herb	100 "
Senna Pods	500 "
Honey	3 kilos.
Sugar	4 "
Water	q. s.

Infuse the drugs with 5 kilos. of boiling water; after twelve hours express, and repeat the infusion with 3 kilos. of boiling water; unite the liquids, strain, add the honey and sugar, and boil the liquids down to 31° Baumé (sp. gr. 1.275).

The above speciality is used for habitual constipation.

Corrosive Sublimate Gauze. (*Brit. Med. Journ.*, April 5, 1884.) In the New York Hospital, corrosive sublimate is used almost exclusively as an antiseptic upon gauze or jute. The sublimated

gauze is prepared by immersing the bleached material in a solution as follows: Corrosive sublimate, 20 parts; water, 4480 parts; glycerin, 500 parts, for twelve hours; then wringing out, and allowing to dry, as far as the glycerin will permit. At the time of operation, a sublimate solution (1 in 1000) is allowed to trickle slowly but nearly continuously over the incision. Bleeding vessels are tied with sublimated catgut. No impervious protective is used over the dressings, as by retaining the moisture of the dressings and the sweat, it is thought to act too much as a poultice. Metallic instruments must be immersed in a five per cent. carbolic solution, as the bichloride will form an amalgam with them. In the New York Hospital, not only is the part to be operated upon washed with soap and water, but also with turpentine and alcohol, two ounces to the pint.

Phosphorated Solution of Albuminate of Iron. L. Feichtmayer. (*Pharm. Centralhalle.*) The author proposes to prepare this compound in the following manner:—

The white of 1 egg (which should be as fresh as possible) is dissolved in 500 grams of distilled water, the solution mixed with 10 grams of ethereal tincture of chloride of iron, decolorized by light, and finally with 4 drops of a one per cent. solution of phosphorus in ether.

If the preparation is not needed immediately, it should be allowed to stand for twenty-four hours, and then filtered.

Boracic Acid Ointment for Eczema. (*Pharm. Centralhalle.*)

Acidi Borici sublt. pulv.	. . . . .	6.0
Vaselini . . . . .	. . . . .	30.0
Bals. Peruviani . . . . .	. . . . .	0.50

M. ft. ungt.

Cure for Nitric Acid Burns. A. Irving. (*Chemical News*, xlix. 200.) A weak solution of sulphurous acid is recommended by the author for this purpose; and its action is accounted for by its power of arresting the destructive oxidation of the nitric acid. He had occasion to test its efficacy on himself. He found that in a very few minutes the blister was reduced; the oxidizing process of the strong acid was completely arrested, without having reached the roots of the hairs on the face; the painful irritation was completely removed, and in an incredibly short space of time the wound healed.

Tinctura Lappæ. C. A. Heinitsch. (*Amer. Journ. Pharm.*, 1883, 569.) This preparation, which has been strongly recommended

for the treatment of *psoriasis inveterata*, may be prepared according to the following formula :—

Ground Burdock Fruit . . .	16 troy ounces.
Alcohol	3 pints.
Water	1 pint.

Mix the liquids, and percolate in the usual way until 4 pints of tincture are obtained. The dose used is a teaspoonful three or four times a day. The remedy seems to be effective; after several months' use the patient's hands and nails assume a normal condition.

Alcohol from Chestnuts. (*Chem. and Drugg.*, 1883, 562.) According to the *Moniteur du Produits Chimiques*, alcohol can be extracted from chestnuts, 100 litres of the latter yielding 8 litres of a very good spirit. The chestnuts are first dried, to develop the saccharine matter. They may be kept for a considerable time in the dry state. They are next decorticated, and afterwards treated by water and warmed till the sugar has been extracted. The solution thus obtained is called *tanade*. The chestnuts are then crushed, and with the *tanade* submitted to fermentation; after which the alcohol is extracted by distillation; the residue serves as a useful food for fattening cattle.

Carthamin. (*New Remedies*, 1883, 273.) This is the beautiful colouring matter obtained from the safflower (*Carthamus tinctorius*), and has the composition $C_{14}H_{16}O_7$. Cooley gives the following mode of preparation :—

Safflower, exhausted by washing it with water (or with water acidulated with acetic acid), is dried, coarsely powdered, digested in a weak solution of carbonate of sodium; pieces of clean white cotton or calico are then immersed in the solution, and acetic acid gradually added in slight excess; the cotton is next washed, dried, and digested in a fresh quantity of dilute solution of carbonate of sodium, and agitation employed until the whole of the colour is again dissolved; the new solution is filtered, and slightly supersaturated with citric acid (or acetic acid); the carthamin, which falls down in rich crimson-red flocks, is lastly washed with cold distilled water, and dried.

It forms an amorphous, brilliant greenish powder, nearly insoluble in water, soluble in alcohol, forming a gorgeous purple solution, and in weak alkaline leys giving an equally beautiful red one.

This is said to be the only article which will brighten the complexion without injuring the skin.

To prepare rouge for the skin, to the second alkaline solution mentioned above, a quantity of finely-powdered talc or French chalk, proportionate to the intended quality of the rouge, should be added. Mix well; precipitate with lemon juice; and lastly collect the powder, dry it with great care with as little heat as possible, and triturate it with a very small quantity of oil of sweet almonds, to render it smooth and adhesive. In this form it is most applicable for the lips.

When used as a powder, it is reduced with talc to extreme fineness, and is applied by means of a small powder-puff.

Acacia Paste: a Substitute for Pate de Guimauve. E. Schewyck. (*Journ. de Pharm. d'Anvers.*) The author suggests the following:—

Powdered Gum Arabic	200 grams.
Powdered White Sugar	200 „
White of three Eggs	
Orange-flower Water	60 „

Mix the powders, add the whites of eggs whipped into snow with the orange-flower water, and mix the mass carefully, thicken it with the aid of a gentle heat applied for about ten minutes, kneading it constantly, and when the paste is of such a consistence that it no longer adheres when applied by the spatula to the wood, run it on tins previously well floured.

Remedy for Sweating Feet. A. M. Vail. (*Journ. Am. Med. Assoc.*, November 3, 1883.) The author recommends the following:—

R Alum exsicc.	2 grains.
Acidi Boracici	2 „
Aquæ Rosæ	35 „

M. Apply with soft sponge without rubbing, just as soon as the shoes and stockings are removed, while the feet are yet moist. This is quite necessary, as also the care not to rub.

Let this be repeated every two or three days in the evening.

Kerosine Emulsion: an Effective Insecticide for Fruit Trees. R. McClachlan. (*Chem. and Drugg.*, 1884, 25.) This preparation is made as follows:—

Pure Kerosine	1 gallon.
Condensed Milk	1½ pint.
Water	3 pints.

Mix the milk and the water before adding the oil, and churn until the whole solidifies and forms a “butter.” In applying this prepa-

ration, the kerosine "butter" should be diluted with from twelve to sixteen times its quantity of water, and be applied immediately, for if it is allowed to stand, the "butter" rises to the surface, and the solution is imperfect. The insects can be more readily combated by insecticides just after emergence from the egg.

Purification of Rancid Castor Oil. (*Oil, Paint, and Drug Reporter.*) 100 lbs. of the rancid oil are heated to 30° C. in a boiler; then a mixture of $\frac{1}{2}$ lb. of alcohol (96 per cent.) and $\frac{1}{2}$ lb. of sulphuric acid is added and crutched in. The mixture is then allowed to settle, and the oil is drawn off from the impurities which have settled at the bottom. The oil is again washed with water by boiling with it for half an hour. The mixture is then allowed to rest until the oil has collected on the surface, when it is carefully removed. Rancid oil, after having been treated in this way, is again fit for use in the manufacture of transparent soap.

Castor Oil and Glycerin. (*Chem. and Drugg.*, 1883, 460.) Dr. William Soper claims that glycerin increases the purgative power of castor oil when given with it. A preparation combining but not mixing these two is active in teaspoonful doses (*Lancet*). In the Pharmacopœia of the hospital of the University of Pennsylvania is the following formula by Professor H. C. Wood:—

Mixtura Olei Ricini.

Ol. Ricini	f. 3j.
Glycerinæ	f. 3j.
Ol. Menthæ Piperitæ	gtt. iij.

Mix.

Palatable Cough Mixture. J. M. Fothergill. (*Chem. and Drugg.*, 1883, 406.) The author recommends the following:—

Syr. Scillæ	3j.
Acid. Hydrobromic. dil	3ss.
Spirit Chloroform	3ss.
Aquæ	3j.

Inhalation for Catarrh, Coryza, Asthma, etc. (*Chem. and Drugg.*, 1884, 23.) The *D. A. Apoth. Zeit.* quotes from the *J. de Med. de Paris*, the formula below, from the prescription of M. St. Martin:—

Acid. Carbolic.	5 parts.
Ammon. pur. liq.	6 "
Aqua dest.	10 "
Alcohol	15 "

Soak some cotton wool well with this mixture, and breathe the vapour from a wide-mouthed bottle.

Angostura Bitters. (*Drugg. Circular.*)

Angostura Bark.	3iv.
Chamomile Flowers .	. . . . .	3i.
Cardamom Seeds .	. . . . .	5ij.
Cinnamon .	. . . . .	3ij.
Orange Peel .	. . . . .	3i.
Raisins .	. . . . .	1 lb.
Diluted Alcohol .	. . . . .	2½ galls.

Macerate for one month, then press and filter.

Starch in Soap. E. Herman. (*Seifensieder Zeitung*, xxi. 245; *Journ. Soc. Chem. Ind.*, 1883, 385.) Potato-starch is frequently added to the soft soaps of commerce, and the quantity present can be determined with facility in the following manner: 10 grams of the soap for examination are dissolved, with the aid of heat, in spirit of wine of 85 to 90 per cent. strength. In the case of pure soap the solution is perfectly clear, but with soap containing starch an insoluble residue settles down at the bottom of the vessel. This residue can be washed by decantation on to a tared filter paper, dried at a low temperature, and weighed. It is of a greenish colour, pulverulent, and, on being boiled with water, forms a paste which reacts strongly with iodine. An examination under the microscope is also of great service. One-tenth of the quantity above mentioned, i.e., 1 gram, is also quite sufficient for the examination, but for manufacturers, etc., the larger quantity is safer. A small addition of starch cannot be considered an adulteration, and indeed for some purposes it is of a certain advantage, as in the treatment of wool and silk. In contracting to supply manufacturers of textile fabrics, the soap maker is frequently obliged to definitely settle the amounts of fatty acids, alkali, potato-starch, and resin which shall be present in the soap. A soap suitable for fulling cloth and for other purposes should not contain less than 40 per cent. of fatty acids, nor more than 5 per cent. of resin and 6 per cent. of potato-starch.

Sapo Mercurialis. Dr. Oberländer. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 487.) This preparation, which is intended to replace mercurial ointment, is made by intimately incorporating 1 part of mercury with 3 parts of a pure neutral soft soap, with the aid of a little glycerin. It is superior to the ointment on account of the greater readiness with which it is absorbed by the moist skin, and also on account of its being less irritating.

Almond Cream Soap. (*Chem. and Drugg.*, 1883, 359.)

Adeps	250 parts.
Liquor Potassæ	100 „
Alcohol	6 „
Ol. Amygd. amar.	$\frac{1}{2}$ „

Artificial Heliotropine (Piperonal). (*Chemiker Zeitung*, February 7, 1884. From *Chem. and Drugg.*) The starting-point in the manufacture of artificial heliotropine, which is now so much used in perfumery, is white pepper.

The first operation is the extraction of piperine with alcohol. Piperine is then converted into potassium piperate by boiling it for twenty-four hours with its own weight of caustic potass and from 5 to 6 parts of alcohol, using an inverted Liebig's condenser. On cooling, the potassium piperate, which crystallizes out in shining yellow laminae, is washed with cold alcohol and recrystallized from hot water; if coloured, it is bleached by animal charcoal.

The next and last operation consists in the formation of piperonal, or artificial heliotropine.

One part of potassium piperate is dissolved in from 40 to 50 parts of hot water, and a solution of 2 parts of potassium permanganate gradually poured in under constant stirring. A pasty mass is formed, which is placed on a filter and washed with hot water until the washings cease to smell of heliotropine. The filtrate and washings are then fractionally distilled over an open fire. The first portions of distillate contain the largest proportion of piperonal (heliotropine), the greater part of which crystallizes out on cooling. The remainder may be obtained by shaking with ether.

Macassar Hair Oil. (*Chem. and Drugg.*, from *Seifenfabrikant.*) Digest $2\frac{1}{2}$ ounces alkanet root or 75 grains of alkannin in 2 lbs. best olive oil in a warm place for several days. Filter through paper, and add oil of lemon 24 grains, oil of cinnamon and oil of cloves, of each 15 grains, otto of roses 6 minims. Or in place of this perfume add oils of cinnamon and cloves, of each 15 grains, oil of melissa 24 grains, oil of bergamot 75 grains, otto of roses 3 drops.

Burdock Root Hair Oil. (From *Oil, Paint, and Drug Reporter.*) One hundred and fifty grams of dry burdock root, cut into small pieces, are placed in a wide-necked bottle, and covered with 1 lb. of good pure olive oil. The bottle is put in a warm place. The oil is filtered through filter paper or cloth. For perfume add:—

Oil of Rose	6 grams.
„ Bergamot	16 „
„ Geranium	4 „
„ Lemon	5 „

Kraetzer's Formula for Hair Oil. (From *Oil, Paint, and Drug Reporter*.) One pound of crushed wormwood is boiled in a little water; then the crushed mass is covered with $1\frac{1}{4}$ lbs. of purified rape-seed oil and 500 grams of alcohol. The mixture is well boiled and the oil pressed out. This process is repeated three times, using fresh quantities of wormwood each time; in the last two operations 16 grams of lard are added each time.

When rape-seed oil is used instead of olive oil, it is important that proper perfumes be used. It is best to use those oils which have a powerful odour, such as geranium, cinnamon, cloves, etc.

In several experiments made with vaseline oil, it proved to be an excellent material for making hair oil. All oils, even the most expensive, are subject to rancidity, when exposed to light and air, to such an extent that at times it becomes impossible to hide their odour with the perfume. Glycerin can also be used in making hair oils; like vaseline, it does not turn rancid.

A preparation similar to hair oil can be made according to the following formulæ: 45 grams of honey are heated in a litre of water until completely dissolved; then filtered through a cloth, and 150 grams of glycerin added to the filtrate. To this mixture is added a solution of 2 grams of oil of lemon, $1\frac{1}{2}$ gram oil of bergamot, 12 drops oil of rose, and 18 drops oil of orange, in 225 grams of Cologne spirits. The whole is coloured with a small quantity of tincture of saffron, and again filtered through cloth.

Hungarian Cosmetic (for the Beard). A. Vomáčka. (*New Remedies*, 1888, 367.)

Spermaceti	50 parts.
Wax (yellow or white)	200 „
Water	500 „
Gum Arabic	150 „
Soap	100 „
Glycerin	50 „
Oil of Bergamot	5 „
„ Geranium	5 „

Mix the finely-cut soap and finely-powdered gum Arabic with 200 parts of the water to a uniform paste, melt the wax and spermaceti with 300 parts of the water, upon a water-bath, and when they are melted gradually add and incorporate the soap-paste, constantly stirring. Remove the heat, add the glycerin very gradually, and allow it to cool, continuing the stirring. Then add the aromatic oils, or, in place thereof, any other that may be preferred.

This formula yields a very good product, which may be kept for a long time unaltered in well-closed vessels. In order to produce the proper colour, it is necessary to add: for *brown*, a sufficient quantity (more or less, according to the depth of tint desired) of burnt umber or sienna, which is to be triturated with the glycerin to a fine paste, entirely free from grittiness; for *black*, add a proper amount of lampblack to the brown cosmetic. Too much lampblack makes the cosmetic sticky and smeary.

In the case of coloured cosmetics, yellow wax may be used. For *white* cosmetic, however, white wax must be employed.

Strawberry Pomade. (*New Remedies*, 1883, 207.)

Fresh ripe Strawberries	4 parts.
„ Lard	25 „
„ Tallow	5 „
Alkanet	q.s.
Oil of Rose	q.s.

The strawberries are put on a straining cloth, and the lard and tallow, previously melted and heated to 100° C. (212° F.) and tinted red with alkanet, poured over them. The strained mass is stirred until it begins to set, and for each 2 pounds of product, 1 drop of oil of rose added.

Cold Cream. A. Vomáčka. (*New Remedies*, September, 1883.)

The author gives the following formula and directions in the *Seifenfabrikant* :—

White Wax	200 parts.
Spermaceti	500 „
Oil of Almonds, expressed	1600 „
Rose Water	80 „
Oil of Rose, for each 2·4 kilos.	30 drops.

Melt the wax and spermaceti at a gentle heat on the water-bath, pour the mass into a very shallow, warmed porcelain dish, and let it stand over night covered with paper. Next morning begin to work the hardened mass by a gentle, uniform to-and-fro motion of the pestle, which should be held lightly between the fingers without exerting pressure, commencing at the edge, gradually working towards the middle, and mixing thoroughly.

The prescribed amount of rose water is now slowly added, in a thin stream, and while constantly stirring. If desired, 5 grams of borax may be dissolved in the rose water, which will facilitate the combination. The mortar is now well covered and set aside for one or two days, in order to give the fat a chance to combine with the

water. It is then again briskly stirred for a quarter or half an hour, and finally the oil of rose is added, previously dissolved in a little castor oil, which latter imparts to the cold cream an extremely handsome dull lustre.

To prevent cold cream becoming rancid or acid, a small quantity of salicylic acid dissolved in rose water or sweet spirit of nitre may be added.

In place of oil of rose, other oils or mixtures of oils may be used; as for instance,—

1.	
Oil of Neroli	10 parts.
„ Rose	5 „
„ Lemon	15 „
2.	
Oil of Bergamot	9 grams.
„ Lavender (finest)	3 „
„ Rose	35 drops.
3.	
Oil of Lemon	5 parts.
„ Lavender (finest)	5 „
Musk	0·4 „

In the same manner as the above is prepared.

Vaseline Cold Cream.

Spermaceti	150 parts.
Paraffin	150 „
Vaseline, white	1000 „
Rose Water	600 „
Oil of Rose, to every 2·4 kilos.	30 drops.

Sachet Powders. (From the *Druggists' Circular*.)

Violet.

Powdered Orris-root	24 ounces.
Gum Benzoin	3 „
Tonka Bean	4 drachms.
Oil of Bitter Almonds	6 drops.
Extract of Cassia	6 drachms.

Musk.

Powdered Orris-root	2 pounds.
Grain Musk	30 grains.
Carbonate of Ammonia	10 „
Oil of Rose	20 minims

Lavender.

Lavender Flowers	8 ounces.
Dry Thyme	4 drachms.
Dry Mint	2 „
Cloves	2 „
Oil of Lavender	30 minims.
Tincture of Ambergis	1 drachm.

Patchouli.

Powdered Orris-root	1 pound.
Patchouli Leaves	8 ounces.
Oil of Rose	30 drops.
„ Patchouli	66 „

Fumigating Paper. A. Vomáčka. (*American Drugg.* 1884, 68, from the *Seifenfabrikant*.) There are two kinds of fumigating paper in use, one which burns or glows when ignited, and another which does not burn, but is only carbonized.

Though the latter kind would be preferable, because a slow volatilization and combustion does not injure the fine aroma of certain substances so much as a higher heat, yet the precaution to place this kind of paper only on a moderately warm place of the stove is so generally disregarded that it is better, after all, to furnish only the combustible paper. In fact, most customers who call for fumigating paper are accustomed to the latter.

Before impregnating the paper with the aromatic substances, it must be prepared with a substance which will cause it to be readily carbonized or burned.

1. *Incombustible Paper.*—Dense, sized paper is saturated with a solution made from 1 part of alum and 10 parts of distilled water, and dried.

2. *Combustible Paper.*—Very fine tissue or cigarette paper is saturated with a hot solution containing 1 part of nitrate of potassium in 10 parts of water, and then dried. This process is several times repeated.

Either one of the above kinds of paper may be coloured by adding to the solution of alum or saltpetre some water-soluble aniline colour, such as eosine, brown, methyl-green, nigrosin (G.G.), indigo-blue, methyl-violet, silver-grey, phosphine, orange, etc.

The aromatic solutions with which the paper is next to be impregnated may be prepared after formulæ like the following:—

1.

Bretfeld Spirit	1000 parts.
Myrrh	40 „
Benzoin	500 „
Oil of Rose	6 „

2.

Bretfeld Spirit	750 „
Balsam of Tolu	200 „
Benzoin	100 „
Tonka Bean	25 „
Oil of Vetiver	30 „

Bretfeld spirit is prepared thus:—

Orris Root	230 grams.
Musk	0.15 gram.
Alcohol	2240 grams.
Oil of Lemon	60 drops.
„ Rose	60 „
„ Neroli	90 „

White Fillings for Decayed Teeth. (*Chem. and Drugg.*) There are several white fillings in use by dental surgeons which contain neither mercury nor silver. The *Scientific American* says they are made by mixing oxide of zinc with impalpable glass powder in small proportions, and just before using, when the cavity of the tooth is prepared, a small quantity of deliquesced chloride of zinc is placed on a glass slab, and enough powder added to make a thick paste, mixed rapidly. It “sets” very quickly, and forms a good temporary stopping. It is slightly irritating to the “nerve” of a tooth, and should not be inserted directly in a cavity in which caries has far advanced without placing a little solution of gutta-percha in chloroform over the region of the pulp. But a less irritating filling, according to the *Lancet*, is made by mixing the same power of oxide of zinc with pyrophosphoric acid; this is a more permanent white stopping.

Tooth Wash. A. Vomáčka. (*Rundschau*, July 20, 1883.) A tincture is made from chips of cedar-wood, such as is used for the finer qualities of lead pencils, treating 1 part of it with 5 parts of brandy. In 250 grams of this tincture dissolve oil of pepper-mint 2 grams, oil of anise 1 gram. The author states that this resembles Pierre's *eau dentifrice*.

Kid Glove Cleaner. (*Pharm. Record.*)

Dissolve in warm Water	150 parts.
White Soap	250 „

When cool add—

Solution of Chlorinated Soda	. . .	165 parts.
Water of Ammonia	. . .	10 „

Rub all into a smooth paste, and apply a little to the glove by means of a piece of flannel.

Bleaching Sponges. (*New Remedies*, July, 1883.) The following methods are recommended by correspondents of the *Pharmaceutische Zeitung* :—

1. First clean, wash, and squeeze out the sponges; then dip them into a two per cent. solution of permanganate of potassium. Here they become quite brown (from separated manganic oxide); after ten minutes they are taken out, washed in water, again well-pressed, and then dipped into a two per cent. solution of oxalic acid preferably diluted sulphuric (1:20) or diluted hydrochloric acid (1:15)], in which they become perfectly white. Success mainly depends on the soaking in the permanganate solution; if they are macerated too short a time, they do not become thoroughly white; if too long, they are apt to become rotten (Dr. Siemens).

2. First clean the sponges by immersing them in diluted hydrochloric acid. Then soak them in the bleaching liquid, composed of hyposulphite of sodium 1 part, water 12 parts, and hydrochloric acid 2 parts. After some time they are removed and well-washed. To the last wash-water a little glycerin is added in order to preserve the sponges soft. The liquid is best pressed out by passing the sponges through a clothes-wringer.

Toilet sponges, which have been in use, often become peculiarly slimy, fatty, and almost useless, owing to some action of the soap. Mere washing in distilled water does not remove the difficulty. It may be overcome by using fused chloride of calcium. The sponge is pressed as much as possible, placed on a plate, the powdered chloride of calcium sprinkled upon it, and allowed to deliquesce upon the sponge. After about half an hour, the sponge may be washed in water and dried, when it will become white (M. v. Valta).

Though all the above processes furnish satisfactory results, yet the following combination and modification of two of the above processes, which was devised by Mr. John Borham, and has been in use in Bellevue Hospital for a considerable time, will be found to work better still :—

Soak the sponges, previously deprived of sand and dirt by beating

and washing, in a one per cent. solution of permanganate of potassium. Then remove them, wash them thoroughly with water, and press out the water. Next put them into a solution of one half pound of hyposulphite of sodium in one gallon of water, to which one ounce of oxalic acid has been added, and leave them in the solution for fifteen minutes. Finally, take them out and wash them thoroughly.

By this treatment the sponges are rendered perfectly white. Many sponges contain a more or less dark coloured, brownish core. If treated only with permanganate and acid, the core is either not bleached at all, or if it has been somewhat bleached, the tint is apt to grow again darker. By the above modification, every portion of the sponge is rendered white, and remains so.

To Impart a Fresh Green Colour to Fats and Oils. C. Schmidt. (*New Remedies*, 1883, 197.) According to the author, this may be accomplished by heating the oil with about one-twentieth part of water, and a sufficient amount of finely-cut green grass, over a naked fire, under constant stirring, until the water is evaporated. [The process is mentioned in reply to a query in the *Pharmaceut. Zeitung*, how a fine green colour may be imparted to the so-called olea cocta and other preparations supposed to be made from fresh chlorophyll, containing parts of plants. The same process may be used for imparting a fine green colour to preserved vegetables, pickles, etc.].

The same author states that the same effect may be produced in water (when green grass is not available) by triturating enough of a mixture containing 10 parts of powdered turmeric and 1 part of indigo with the water before heating with the oil.

Lime as a Solvent for Gum Resins. (*New Remedies*, 1883, 209.) A weak ($7\frac{1}{2}$ per cent.) solution of caustic lime serves (according to the *Pharm. Centralhalle*) as a useful solvent for many gum resins, allowing the solutions to mix with water without precipitation. The proportions that may be dissolved are: aloes, 1 in 15; ammoniacum, 1 in 4; assafoetida, 1 in 15; catechu, 1 in 10; guaiacum, 1 in 7; myrrh, 1 in 5; opium, 1 in 10.

Red Ink. The *Deutsch. Apoth. Zeitung* gives the following formula:—

Cochineal	1 ounce.
Gum Arabic (in powder).	1 "
Potassium Tartrate, cryst.	1 "
Distilled Water (hot)	8 ounces.

Make a solution, filter, and add—

Burnt Alum	. . . . .	2 drachms.
Oil of Cloves	. . . . .	4 minims.

This makes an exceptionally fine ink.

Ink for Marking Packages. (*Chem. and Drugg.*, 1883, 612.) Shellac, 2 ounces; borax, 2 ounces; water, 25 ounces; gum arabic, 2 ounces; venetian red or lampblack, sufficient to colour. Boil the borax and shellac in the water until they are dissolved, add the gum arabic, and withdraw from the fire. When the solution has become cold, make up to 25 ounces with water, and add venetian red enough to bring it to a suitable consistence and colour. This ink must be preserved in a glass or earthenware vessel.

Gold Ink. (*Chem. and Drugg.*, 1883, 612.) *Rundschau* quotes from *Rheinfeld* in the *Seif. Ztg.* the following process:—Take equal parts of iodide of potassium and acetate of lead; put them on a filter, and pour over them twenty times the quantity of warm distilled water. As the filtrate cools, iodide of lead separates in golden scales. This is collected when the filtrate has quite cooled, washed with cold water on a filter, and rubbed up for an ink with a little mucilage. The ink thus made must be shaken every time it is used.

Indelible Marking Ink free from Silver. (*Drugg. Circular.*) To a concentrated aqueous solution of chloride of copper add solution of caustic potash as long as a precipitate is produced. Allow to settle, decant or siphon off the supernatant liquid, and dissolve the precipitate in the least possible quantity of water of ammonia. Finally, add about 6 per cent. of dextrin. After the writing made with this ink is dry, it must be gone over with a hot iron before being washed.

Refining of Shellac. E. L. Andés. (*Archiv der Pharm.* [3], xxi. 291.) The crude shellac is refined in the following way: $1\frac{1}{2}$ kilos. of soda are dissolved in 45 litres of water contained in a small boiler or kettle; 5 kilos. of the crude shellac are added in small quantities at a time. This turbid solution has the characteristic odour of shellac and a violet-red colour. The liquid is boiled for a few minutes, and, while hot, a wooden air-tight cover is cemented on the vessel. When the liquid is quite cold, the cover is removed, and the thin cake of fat which is found on the surface is separated. The solution is filtered through linen, the clear filtrate slowly decomposed with dilute sulphuric acid, and the resulting shellac washed with water until no acid reaction remains.

The washed resin is now pressed and melted in boiling water, when it can be shaped with the fingers. This shellac is cooled in water containing glycerol, and when hard, is dried. The refined shellac forms yellowish white glistening tufts or bars, which, when dry, are yellowish brown; it should entirely dissolve in alcohol.

Valuation of Gelatin. F. Prollius. (*Dingl. polyt. Journ.*, ccxlix. 425. From *Journ. Chem. Soc.*) The author has determined the amount of ash, water, and insoluble matter (residue insoluble in hot water) in various kinds of gelatin. To ascertain the gelatinizing property, 1 part of the sample was dissolved in 90 parts of water, filtered, and the degree of viscosity determined.

	Ash.	Water.	Insoluble.	Time required for the solution to run out.
	p.c.	p.c.	p.c.	seconds.
Astracan, from Schmidt and Dihlmann, Stuttgart.	0.20	16.0	2.8	507
Ditto, from a collection	0.37	18.0	0.7	485
Ditto, fine iridescent Russian quality, Tübingen collection. . .	1.20	17.0	1.0	500
Ditto, Russian, from Gehe of Dresden	0.80	19.0	3.0	491
Ditto, in laminæ, from Gehe . . .	0.50	19.0	0.4	480
Ditto, in threads, known as Hamburg threads.	0.40	17.0	1.3	477
Hamburg Isinglass	1.30	19.0	2.3	470
Another quality	0.13	19.0	5.2	...
Rolled northern Fish Bladder . .	3.20	1.5	10.8	467
Icelandish Bladder.	0.60	17.0	21.6	463
Indian Isinglass	0.78	18.0	8.6	437
Yellow, quality unknown	2.30	17.0	15.6	360

To judge of the purity of isinglass, it is also recommended to subject the example to microscopic examination.

Substitute for Tartar Emetic in Dyeing. (*Dingl. polyt. Journ.*, ccli. 48.) Tartar emetic is being gradually replaced in dyeing and printing by a new antimony preparation, consisting of potassio-antimonic oxalate, $C_6O_{13}SbK_3 + 6H_2O$. It is obtained by saturating a boiling solution of hydrogen potassium oxalate (salt of sorrel) with freshly precipitated antimonious oxide, and filtering the mixture whilst hot. On cooling, potassio-antimonic oxalate crystallizes out. This preparation is sold at a moderate price as a substitute for tartar emetic in fixing tannin colours.

Colouring Amber. E. Hanausek. (*Oil, Paint, and Drug Reporter.*) For colouring amber it is necessary to find a liquid in

which the amber can be heated, and this liquid must fulfil the following conditions:—Its boiling point must lie above 150° C., and it is better if it boils above 200° . The amber must not be attacked by the hot liquid, nor must its physical characters be changed. The liquid must be able to dissolve dyes, and not decompose them, or at least not rapidly. It should also be mentioned that the dyestuffs employed must not decompose at 150 or 200° C. Many of the fatty or essential oils, and also solid fats and hydrocarbons which melt below 150° may fulfil these conditions. The attempt to impart different shades of colour to amber was made with linseed oil. The following pigments dissolve in it without being entirely decomposed at 200° C., viz., dragon's blood, alizarine, purpurine, and indigo. Of the aniline colours, fuchsin, aniline violet, methyl green, and alkali blue, all refuse to dissolve in pure linseed oil. In carrying out the experiment a weighed quantity was stirred into linseed oil, and the piece of amber to be coloured suspended therein, and slowly heated to 190 or 200° C. The liquid was then kept for some minutes at the temperature of 180 or 200° , after which the source of heat was removed, and the hot liquid allowed to cool. After taking the amber out of the oil and cleansing it, it was found to be dyed.

A light or dark reddish brown can be made with dragon's blood, bright yellow with alizarine, an orange-yellow with purpurine, light or dark green, dark blue, and black from indigo. The proportions of indigo that must be taken to obtain the shades mentioned are given as follows:—For light green, $\frac{1}{4}$ th of a part of indigo to 100 parts of oil; for dark green, $\frac{1}{2}$ a part to 100; for dark blue, 1 part of indigo to 100; and finally, for black, 4 or 5 parts of indigo to 100 of oil. On heating the oil, the indigo dissolves in it and imparts to it a very beautiful reddish purple.

By frequently heating these mixtures to 200° C., both the indigo and the linseed oil suffer some change. The oil gets thicker and turns brown, and when heated it no longer assumes such a fine purple colour. A mixture that has undergone this change from heating, colours amber brownish; hence, when it is desired to obtain pure shades of green and blue, it is necessary to frequently change the dye baths or renew them. In dying black it is not necessary to suspend the amber in the liquid, for it is coloured more quickly when it lies on the bottom in contact with any undissolved indigo.

If finely pulverized asphalt is put in linseed oil, and the oil heated until it almost boils, a portion of the asphalt will dissolve, forming a brownish liquid and having a distinct green fluorescence.

Amber that has been heated in this liquid for a long time to 200° C. acquires a brownish colour, and has a slight greenish fluorescence. This fluorescence is, however, much more distinct and striking if the amber is subsequently heated in a mixture of 1 part of indigo in 1000 of oil. All hydrocarbons which are fluorescent themselves can impart this quality to amber.

Label Varnish. (*New Remedies*, 1883, 301.) One of the best label varnishes is the following :—

Sandarac (in coarse powder)	.	.	.	100 parts.
Mastic	"	"	.	40 "
Copaiba	.	.	.	15 "
Venice Turpentine	.	.	.	30 "
Oil of Turpentine	.	.	.	40 "
Alcohol	.	.	.	90 "
Absolute Alcohol	.	.	.	90 "

Macerate until solution is effected.

Rapidly Drying Varnish. W. Dauner. (*Amer. Journ. Pharm.*, 1884, 294.) The author recommends the following :—Mix intimately colophony with thick milk of lime, after twenty-four hours dry by heat, and powder. This powder is used for preparing varnishes from soft resin, as follows :—Melt 100 parts of pine resin, add with constant stirring 10 to 15 parts of the above powder, continue to heat for thirty minutes, remove from the fire and add 25 to 50 parts of linseed oil and 35 to 90 parts of turpentine, according to the thickness desired.

Novelties in Varnishes and Shoe Polishes. (*Pharmaceutical Record*, June 1, 1884.) The *Scientific American* translates the following from a German publication called *Neueste Erfahrungen* :—

Reinhardt has devised a method of destroying the stickiness of varnish, which consists in placing the article in a closed vessel or chamber where it can be exposed to the action of ozonized air in motion.

A leather varnish or polish is prepared by Gunther, of Berlin, by mixing a filtered solution of 80 parts of shellac in 15 parts of alcohol, with 3 parts of wax, 2 parts of castor oil, and a sufficient quantity of pigment. The mixture is evaporated in a vacuum to a syrup. The varnish is applied to the leather with a brush moistened with alcohol or with a colourless alcoholic varnish.

Nicolet, of Lyons, prepares boot blacking by dissolving 150 parts of wax and 15 parts of tallow in a mixture of 200 parts of linseed oil, 20 parts of litharge, and 100 parts of molasses, at a temperature of 230 or 250° F. After this 103 parts of lampblack are

added, and when cold it is diluted with 280 parts of spirits of turpentine, and finally is mixed with a solution of 5 parts of gum lac and 2 parts of aniline violet in 35 parts of alcohol.

Hein, in Kaufering, makes another kind of shoe blacking by melting 90 parts of beeswax or ceresine, 30 parts of spermaceti, and 350 parts of spirits of turpentine, with 20 parts of asphalt varnish, and adds 10 parts of borax, 20 parts of lampblack, 10 parts of Prussian blue, and 5 parts of nitro-benzol.

Brunner uses 10 parts of bone-black, 10 parts of glucose syrup, 5 parts of sulphuric acid, 20 parts of train-oil, 4 parts of water, and 2 parts (carbonate of) soda. The bone-black and glucose are stirred with the acid in a porcelain vessel until the whole mass is homogeneous and has a shining black surface when at rest. The soda is dissolved in a little water, and boiled with the oil under constant stirring until it forms a thick liquid, and then the other mixture is stirred into it. By varying the proportions of these two mixtures, the blacking is made thinner and softer, or harder and firmer. The substances sold as French polish are mostly composed of these ingredients. In this and all other kinds of shoe blacking made with bone-black and sulphuric acid, the precaution must be observed of stirring rapidly and evenly after the acid is added, otherwise lumps will be formed that are difficult to crush, and the blacking will have a granular condition that does not belong to it. Good shoe blacking must always remain soft, and show a smooth, uniform surface when applied to the leather.

Soap Varnishes. E. Andres. (From *Journ. Soc. Chem. Ind.*) This varnish, owing to its cheapness, complete resistance to water, and considerable elasticity, is of value for many purposes. To make it, boil good tallow soap with soft water until dissolved, and filter while hot through cloths, heat again, add an equal volume of water and a boiling solution of alum as long as an alumina salt is precipitated. Let the stearate of alumina settle from off the water, and wash the precipitate thoroughly, then dry and heat on a water-bath until transparent. Finally, stir the preparation into turpentine, heated nearly to boiling, until a solution is made of the consistency of thick varnish, which can afterwards be thinned with more turpentine if required. Johnson's waterproof varnish, for paper and cloth, is made by dissolving copperas in water, adding soap solution thereto, and straining off the precipitated stearate of iron. If this be dissolved in bisulphide of carbon or benzole, a waterproof varnish is obtained. For a white varnish use alum instead of copperas. Varnish for gilding is made as follows:—50 parts

soda are dissolved in 100 parts water in a copper vessel heated to boiling, and 100 parts powdered resin stirred in and boiled for two or three hours until perfectly clear. Let it cool, pour off the supernatant water from the heavy, viscous resin soap, add 100 parts of fresh water and 15 parts of steeped glue, and heat till the whole is dissolved. This makes a quick-drying varnish; for a slow drying varnish add from 10 to 20 parts glycerin of 28° B. The above resin soap, mixed with about 5 per cent. ammonia, forms a very cheap and durable vehicle for paints. Water glass paints are only successful when mixed in small quantities and applied immediately.

Manganese Varnish. (*Oil, Paint, and Drug Reporter*, April 23, 1884.) The manganese varnishes are prepared by the use of manganous oxide, manganic oxide, manganese peroxide, and specially manganese borate. The last-named compound gives a varnish of such excellent properties that it must be preferred to all other substances used for the same purpose.

Manganese borate varnish is prepared in the following manner:—2 kilos. perfectly dry, white manganese borate, free from iron, in very fine powder, are gradually stirred into 10 kilos. linseed oil, which is heated in a suitable vessel. By continual stirring a uniform distribution of the salt in the oil is effected. The heating is continued until the temperature of the oil reaches 200° C. It is to be observed that a good quickly-drying varnish can only be obtained when the manganese borate is entirely free from iron.

1000 kilos. of linseed oil are then heated in the varnish kettle, until it begins to bubble. Then the mixture of linseed oil and manganese borate is run in, in a thin stream, the fire is increased, and the mixture is heated to a violent ebullition. After about twenty minutes' boiling, the varnish is ladled out, filtered while still hot through cotton, and is then ready for use. Slabs of wood which were immersed in the hot varnish were coated with a perfectly dry, glassy layer in from sixteen to eighteen hours.

It was shown by experiment that manganese borate has the property of converting linseed oil, at comparatively low temperatures, into rapidly-drying varnish; a temperature of 40° is sufficient. If a small linen bag containing 30 grams of manganese borate is suspended in a 10-litre flask filled with linseed oil, the latter when placed in a warm place will be converted into a good drying varnish in ten to fourteen days.

Glue for Rendering Paper Waterproof. (*Cosmos les Mondes* April 12, 1884.) Labels may be fixed upon tin boxes, etc., exposed to damp, by the following method. White of egg is diluted

with half a part of water, and applied with a brush to the surfaces to be united. A hot iron is then passed over the paper, so as to coagulate the albumen. By means of successive layers of paper and albumen, waterproof boxes, etc., may be formed.

Paste for Fixing Labels on Metals. (*New Remedies*, 1883, 275.)

The following composition is recommended :—

Mucilage of Tragacanth	10 parts.
Honey	10 „
Flour	1 „

French Shoe Blacking. (*Chemist and Druggist*, 1884, 24, from *Scientific American*.) Vinegar, 2 pints; soft water, 1 pint; glue (fine), 4 oz.; logwood chips, 8 oz.; powdered indigo, 2 drachms; bichromate of potash, 4 drachms; gum tragacanth, 4 drachms; glycerin, 4 oz. Boil, strain, and bottle.

Process for the Preparation of Artificial Gutta-percha. M. Zingler. (*Journ. Soc. Chem. Ind.*, 1883, 355.) 50 kilos. copal and 7.5 to 15 kilos. powdered sulphur are mixed with double the quantity of oil of turpentine, or with 55 to 66 litres petroleum, in a tank which contains an agitator, and the mixture is heated to 122–150°, and stirred till completely dissolved. The mass is then cooled down to about 38°, and a solution of casein added which contains about 3 kilos. of casein dissolved in weak ammonia water and a little methylated alcohol. The mass is then a second time heated to 122–155°, until it assumes a thin consistency. It is then boiled with a solution of tannic acid containing 15–25 per cent. tannic acid and about .5 kilos. ammonia. After boiling for several hours, the mass is cooled, washed with cold water, kneaded in hot water, rolled, and dried.

Waterproof Lac. (*Chemist and Druggist*, 1883, 406.) The lac with which gossamer and other articles made out of gutta-percha were covered to give them their shiny appearance, but without having any detrimental influence upon their waterproof properties, is made thus :—

Gum Lac	600 grams.
Borax	200 „
Aniline Black	2–3 „

The borax is dissolved in hot water, the lac gradually added, the whole boiled to perfect solution, and the aniline at last added. This lac is waterproof, and is applied by being spread over the article with a linen rag dipped into the solution.

More expensive is the following recipe :—1 part of common

black gutta-percha is dissolved in 5 to 6 parts of carbon bisulphide, and applied with a camel's-hair brush. This lac possesses the property of always being elastic, no matter to what temperature of the atmosphere it may be exposed.

Cement for Caoutchouc. (*American Druggist*, 1884, 95.) Powdered shellac is soaked in ten times its weight of stronger ammonia water, whereby a transparent, gelatinous mass is produced, which is afterwards melted by placing the vessel in hot water. (It is also stated that the mass becomes liquid of its own accord on standing for some weeks.) When using the cement, the surfaces of the caoutchouc are coated with some of the liquid mass and then firmly pressed together. As soon as the ammonia has evaporated, the caoutchouc joint hardens, and the points of union become as firm as the caoutchouc itself. The same cement is also stated to be suitable for fastening caoutchouc upon metal, glass, or other smooth surfaces.

An Improved Metallic Cement. J. McConnell. (*Journ. Soc. Chem. Ind.*, 1884, 109.) Finely-divided "black antimony" and finely-divided plumbago are intimately mixed together, and the mixture is then added to and well stirred with molten sulphur. The resulting cement is said to be "particularly adapted for closing holes and joints in cast or malleable iron, as also for cementing metal into stonework and uniting the joints of gas and water pipes, as well as of steam piping where the temperature is not higher than the melting point of the cement itself.

Permanent Bleaching of Bone and Ivory. C. Puscher. (*Pharm. Centralkalle*, October 4, 1883.) According to the author, bone and ivory may be readily and permanently bleached by placing the pieces to be treated in the following solution:—25 grams of pure zinc white are covered with 40 c.c. of water, and 50 c.c. of concentrated sulphuric acid gradually added; 150 c.c. of hot water are then poured in, and, with constant stirring, ammonia in just sufficient quantity to redissolve the precipitated zinc hydrate at first formed, avoiding, however, an excess. A solution of copper sulphate is then added until the yellow tint of the liquid has changed to a bluish white.

The objects must remain in the liquid several days, after which they are well rinsed with water. The author states that old bone or ivory, which has got yellow by age, can be *permanently* bleached by this means, and that the articles are capable of taking a high polish.

Black Candles. (*Chemist and Druggist*, 1884, 290.) It is well known that the juice of the *Anacardiaceæ*, which is white when freshly drawn, turns black on drying. It is, perhaps, however, not equally well known that *Anacardium occidentale* is used for preparing black candles for certain religious purposes. The *Chemiker Zeitung* mentions two ways in which such may be prepared. The first is based on the employment of the fruit of *Anacardium occidentale*, while in the latter so-called fat aniline colour, manufactured by Destrée, Wiescher & Co., of Brussels, is used.

1. *Anacardium Method.*—Paraffin, or whatever material is desired for the candles, is heated to from 200–210° C., with 25 per cent. of its weight of chopped anacardium fruit. Candles prepared in this way are equally black throughout, and yield no irritating vapours when burnt.

2. *Aniline Method.*—The material to be dyed is heated to a few degrees above its melting-point with 1 to 2 per cent. of nigrosine fat colour. Paraffin and spermaceti require 1 per cent.; stearine and wax require from 1½ to 2 per cent. The candles thus prepared are said to be of a sombre hue throughout, and of a jet-black appearance.

A New Method of Preparing Paper Pulp. G. Ardsbold. (*Scientific American*, December 1, 1883.) The author macerates wood or straw, cut into suitable pieces, in dilute milk of lime; after twelve hours introduces them into a suitable digester, and saturates with sulphurous acid, the pressure amounting to four or five atmospheres. In two hours the material is so loosened up that, after washing with water and further treatment under pressure with 3 per cent. chloride of calcium and a half per cent. of aluminium sulphate dissolved in a little water, the stuff obtained without any further operation has the appearance of cotton, and can serve for the manufacture of fine qualities of paper.

A New Process of Bleaching. J. B. Thompson. (From *Pharm. Journ.*, 3rd series, xiv. 857.) An ingenious modification of the process of bleaching has been introduced by the author, which promises to effect a great saving of time and labour. In the ordinary process the goods to be bleached are usually first boiled with lime for about seven hours, after which they are washed in water, and "soured" by steeping them for four or five hours in water acidulated with hydrochloric acid. Then after another washing they are boiled for nine hours in soda-ley, again washed, and next submitted to the "chemicking" process, which consists in steeping them in a dilute solution of chloride of lime for four hours. With

the exception of the lime boiling this treatment is repeated several times, involving in the case of cotton goods some sixteen distinct operations, extending over a period of five to eight days. In the author's process the "souring" and "chemicking" operations are combined in one. The goods are placed in an air-tight "kier," connected on the one hand with a vessel containing a dilute solution of chloride of lime, and on the other with a gas-holder containing carbonic acid gas. A charge of the bleaching solution is first pumped in, and the goods are allowed to soak in it during five minutes, after which communication is opened with the gas-holder and the liquor is run out from the bottom of the "kier." The partial vacuum thus created causes an inrush of the gas, and the goods are subjected to its action for fifty-five minutes, by the end of which time the whole of the chloride has been decomposed in contact with the fibre of the cloth. Bleaching liquor is then again pumped into the "kier," driving the gas back into the gas-holder, and these processes are repeated alternately according to the necessity of the case. Lastly, the goods are passed through a solution of triethylrosaniline and oxalic acid, which removes the natural faint yellow tinge from the cotton.

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PART IV.

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TRANSACTIONS
OF THE
British Pharmaceutical Conference
AT THE
TWENTY-FIRST ANNUAL MEETING
AT
HASTINGS,
1884.

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British Pharmaceutical Conference.

CONSTITUTION.

Art. I. This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following:—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.

2. The subscription shall be 7s. 6d. annually, which shall be due in advance upon July 1.

3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.

4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.

5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.

6. At each Conference, it shall be determined at what place and time to hold that of the next year.

7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.

8. The Executive Committee shall present a report of proceedings annually.

9. These rules shall not be altered except at an annual meeting of the members.

10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

* * * Authors are specially requested to send the titles of their Papers to The Hon. Gen. Secs. Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.

FORM OF NOMINATION.

I Nominate

(Name)

(Address)

as a Member of the British Pharmaceutical Conference.

Member.

Date

This or any similar form must be filled up legibly, and forwarded to The Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., who will obtain the necessary signature to the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

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Warrior, Mr. H., Northallerton.
Waterall, Mr. G. E., Chapel Bar, Nottingham.
Waterhouse, Mr. J., Ashton-under-Lyne.
Watkinson, Mr. J. W., Market Street, Farnworth, Bolton.
Watson, Mr. J. E. H., Rose Corner, Norwich.
Watson, Mr. M., 8, Summerhill Street, Newcastle-on-Tyne.
Watson, Mr. S., 176, High Street, Hounslow.
Watson, Mr. T. D., 23, Cross Street, Finsbury, E.C.
Watts, Mr. C. C., Cliftonville, Brighton.
Watts, Mr. J., Dudley Hill, Bradford, Yorks.
Watts, Mr. W. M., 32, Lower Whitecross Street, E.C.
Wand, Mr. T., 30, Laverthorpe, York.
Wealthall, Mr. A., 156, Great Jackson Street, Hulme, Manchester.
Webb, Mr. E. A., Cookham Dene, Manor Park, Chislehurst, S.E.
Webb, Mr. B. C., Medical Hall, Wexford.
Wellcome, Mr. H. S., 7, Snow Hill, Holborn Viaduct, E.C.
Wells, Mr. J., 52, Upper Sackville Street, Dublin.
Wells, Mr. W. F., junr., 20, Upper Baggot Street, Dublin.
West, Mr. E. R., 17, Strand, Dawlish.
West, Mr. T., 61, Chester Road, Stretford, Manchester.
West, Mr. W., 15, Horton Lane, Bradford.
Westlake, Mr. J., 4, High Street, Sutton.
Weston, Mr. C., 2, High Street, Ventnor, Isle of Wight.
Weston, Mr. S. J., 151, Westbourne Terrace, W.
Westrup, Mr. J. B., 76, Kensington Park Road, W.
Wheeldon, Mr. J., 241, Stockport Road, Manchester.
Wheeler, Mr. C., 148, Hackney Road, E.
Wheeler, Mr. J. W., 1, Jermyn Street, St. James's, S.W.
While, Mr. W. J., 123, London Street, Reading.
White, Mr. E. A., Mayfield, Sussex.
White, Mr. F., London Road, Nottingham.
White, Mr. G., 115, Hall Street, Dudley.
White, Mr. J. F., 13, Blenheim Terrace, Leeds.
White, Mr. W. E., Cuckfield, Sussex.
Whitfield, J., F.C.S., 113, Westborough, Scarborough.
Whitla, Mr. M. R., Medical Hall, Monaghan.
Whitla, W., M.D., L.A.H., College Square North, Belfast.
Whitmore, Mr. W. T., 7, Arlington Street, Piccadilly, S.W.
Whitrow, Mr. B., 15, St. John's Road, Tunbridge Wells.
Whittaker, Mr. E., 32, Regent Road, Salford, Lancs.
Whittle, Mr. S., Leigh, Lancashire.
Whittles, Mr. H., 44, Wheeler Street, Lozells, Birmingham.
Whitworth, Mr. J., 88, Portland Street, Southport.
Whysall, Mr. W., Grantham.
Wigg, Mr. H. J., 225, Oxford Street, W.
Wiggins, Mr. H., 236, Southwark Park Road, Bermondsey, S.E.
Wild, Mr. F., 285, Oxford Street, Manchester.
Wild, Mr. J., Clarendon Place, Hyde, Cheshire.
Wilford, Mr. J., 7, Lower Parliament Street, Nottingham.
Wilkinson, Mr. B. J., 1, Middleton Road, Kingsland, E.
Wilkinson, Mr. G., 267, Waterloo Road, Manchester.
Wilkinson, Mr. T., 270, Regent Street, W.
Wilkinson, Mr. W., 51, Lambeth Walk, S.E.
Wilkinson, Mr. W., 263, Cheetham Hill, Manchester.
Wilkinson-Newsholme, Mr. G. T., 74, Market Place, Sheffield.

- Will, Mr. W. W., Ossory Villa, Ossory Road, London, S.E.
 Willan, Mr. R., 5, Market Street, Ulverston.
 Willan, Mr. W., 8, Friargate, Preston, Lancs.
 Willey, Mr. W., New Clea, Grimsby.
 Williams, Mr. C. E., 38, St. Peter's Road, Great Yarmouth.
 Williams, Mr. E., Cerrig-y-Druidion, Denbighshire.
 Williams, Mr. E., 10, Wrexham Street, Mold.
 Williams, Mr. H., 146, Bradford Street, Birmingham.
 Williams, J., F.I.C., F.C.S., 16, Cross Street, Hatton Garden, E.C.
 Williams, Mr. J., Victoria Road, Aldershot.
 Williams, Mr. J. D., Turret House, Bodmin, Cornwall.
 Williams, Mr. J. V., 95, Old Town Street, Plymouth.
 Williams, Mr. J. W., 6, Giltspur Street, E.C.
 Williams, M. Whitley, F.I.C., F.C.S., 40, Sterndale Road, Brook Green, W.
 Williams, Mr. R., St. Clears, Carmarthenshire.
 Williams, Mr. T., 11, Bute Street, Cardiff.
 Williams, Mr. T. H., 125, Fortress Road, N.W.
 Williams, Mr. W., 265, Crown Street, Liverpool.
 Williams, Mr. W., Llanfyllin.
 Williams, Mr. W., 80, Upper Street, Islington, N.
 Williams, Mr. W. J., 137, Cannon Street, E.C.
 Williamson, Mr. W. H., 54, Dantzic Street, Manchester.
 Willis, Mr. C., 55, High Street, King's Lynn.
 Willmott, Mr. W., King's College Hospital, W.C.
 Willmott, Mr. W., Wicker Brewery, Sheffield.
 Wills, Mr. G. S. V., Gladstone House, St. George's Rd., Southwark, S.E.
 Wilson, Mr. C. F., 23, Liverpool Road, Stoke-on-Trent.
 Wilson, Mr. E., Silverdale, Staffordshire.
 Wilson, Mr. J., General Infirmary, Derby.
 Wilson, Mr. J., Penrith, Cumberland.
 Wilson, Mr. J., 11, George Street, Bath.
 Wilson, Mr. J. H., 6, West Park, Harrogate.
 Wilson, Mr. James Milton, 16, Leven Street, Edinburgh.
 Wilson, Mr. T., Stowmarket.
 Wilson, Mr. T. W., Bootham, York.
 Wing, Mr. G. N., Melton Mowbray.
 Wing, Mr. Lewis, Chislehurst, W. Kent.
 Wink, Mr. J. A., The Nest, East End, Finchley.
 Wise, Mr. J. N., 14 & 15, Claypath, Durham.
 Wood, Mr. A., New Brentford.
 Wood, C. H., F.I.C., F.C.S., Mildmay Chambers, 82, Bishopsgate Street, E.C.
 Wood, Mr. R., 50, High Street, Windsor.
 Wood, Mr. R., 25, Mill Street, Macclesfield.
 Woodcock, R. C., F.I.C., F.C.S., 14, Ferndale Road, Clapham, S.W.
 Woodland, J., F.L.S., F.C.S., Oaklands, Westhall Road, Lordship Lane, S.E.
 Woodland, Mr. W. F., Fore Street, Chard, Somersetshire.
 Woodward, Mr. J. L., Bridgewater.
 Woolford, Mr. J., 61, Kirkgate, Leeds.
 Woolley, Mr. G., Sparkenhoe Street, Leicester.
 Woolley, Mr. G. S., 69, Market Street, Manchester.
 Woolley, Mr. Harold, 69, Market Street, Manchester.
 Woolley, Mr. Hermann, Knowsley Street, Cheetham, Manchester.
 Woolrich, Mr. C. B., Uttoxeter, Staffs.
 Wootton, Mr. A. C., 42, Cannon Street, E.C.
 Wootton, Mr. P., Market Place, Luton, Beds.
 Worfolk, Mr. G. W., Brook Street, Ilkley.
 Worth, Mr. E., Town Hall, Bournemouth.

Wright, A., A.K.C., 8, Bentinck Crescent, Elswick Road, Newcastle-on-Tyne.
 Wright, C. R. A., D.Sc., F.R.S., F.I.C., F.C.S., St. Mary's Hospital, W.
 Wright, Mr. G., 102, High Street, Burton-on-Trent.
 Wright, Mr. J., 46, Bridge Street, Leeds.
 Wright, Mr. T. D., 26, Chapel Street, Southport.
 Wyatt, Mr., H., 20, Derby Road, Bootle, Liverpool.
 Wyborn, Mr. J. M., 59, Moorgate Street, E.C.
 Wyles, Mr. W., 1, New Bridge, Dover.
 Wyley, Mr. W. F., Hertford Street, Coventry.
 Wylie, Mr. D. N., 1, South College Street, Edinburgh.
 Wyman, Mr. J., Charles Street, Farringdon Road, E.C.
 Wynne, Mr. E. P., 8, Pier Street, Aberystwith.

 Yates, Mr. D., 32, Darwen Street, Blackburn.
 Yates, Mr. F., 64, Park Street, Southwark, S.E.
 Yates, Mr. G. A., Birch Villa, Lees, via Oldham.
 Yeomans, Mr. J., 22, Petty Cury, Cambridge.
 Yorath, Mr. T. V., Canton, Llandaff.
 Young, Mr. J., 20, High Street, Newport, Mon.
 Young, Mr. J., Folds Road, Bolton.
 Young, J. R., F.C.S., Sankey Street, Warrington.
 Young, Mr. J. R., 17, North Bridge, Edinburgh.
 Young, Mr. R. F., New Barnet.

NOTICE.

Members are requested to report any inaccuracies in these lists by letter, addressed as follows :—

THE SECRETARY,

BRIT. PHARM. CONF.,

17, Bloomsbury Square,

London, W.C.

SOCIETIES AND ASSOCIATIONS

INVITED TO SEND DELEGATES TO THE ANNUAL MEETING.

The Pharmaceutical Society of Great Britain.
The North British Branch of the Pharmaceutical Society of Great Britain.
The Pharmaceutical Society of Ireland.

ABERDEEN.—Society of Chemists and Druggists (1839). Mr. A. Strachan, 48, Richmond Street, Aberdeen.

ABBROATH.—Chemists' Association (1874). Mr. D. A. Cargill.

ASHTON-UNDER-LYNE.—Ashton-under-Lyne and Dunkinfield Chemists' Association (1869). Mr. E. Fisher, 106, Stamford Street, Ashton-under-Lyne.

BIRMINGHAM.—Midland Counties Chemists' Association (1869). Mr. S. Dawson, 90, New Street, Birmingham. Chemists' Assistants' Association (1868), Birmingham.

BRIGHTON.—Association of Pharmacy (1861). Mr. Marshall Leigh, 46, Dyke Road, Brighton.

BRISTOL.—Pharmaceutical Association (re-established 1869). G. F. Schacht, F.C.S., 7, Regent Street, Clifton, Bristol.

COLCHESTER.—Association of Chemists and Druggists (1845). Mr. W. B. Cordley, Colchester.

COVENTRY.—Coventry and Warwickshire Pharmaceutical Association (1877).

DOVER.—Chemists' Association. Mr. J. Wilford.

DUNDEE.—Chemists and Druggists' Association (1868). Mr. J. Russell, Dundee.

EDINBURGH.—Chemists' Assistants' Association. Mr. J. R. Hill.

EXETER.—Exeter Pharmaceutical Society (1845). Mr. G. Pasmore, Exeter.

GLASGOW.—Chemists and Druggists' Association (1854). Mr. Walter Paris, 83, Stirling Road, Glasgow.

HALIFAX.—Halifax and District Chemists and Druggists' Association (1868). Mr. J. B. Brierley, Halifax.

HASTINGS.—Chemists' Association (1884). Mr. A. N. Beck, 11, York Buildings, Hastings.

HAWICK.—Pharmaceutical Association. Mr. Thomas Maben, 5, Oliver Place, Hawick.

HULL.—Chemists' Association (1868). Mr. C. B. Bell, 6, Spring Bank, Hull.

LEEDS.—Chemists' Association (1862). Mr. J. Hellowell, 88, West Street, Leeds.

LEICESTER.—Chemists' Assistants and Apprentices' Association (1869). Mr. S. F. Burford, Leicester.

LINCOLN.—Chemists' Association. Mr. C. F. Gadd, 200, High Street, Lincoln.

LIVERPOOL.—Chemists' Association (1868). A. H. Samuel, F.C.S., 145, Upper Parliament Street, Liverpool.

LONDON.—Chemists' Assistants' Association. Messrs. E. Baily and J. F. Burnett, 103, Great Russell Street, W.C.

MANCHESTER.—Chemists and Druggists' Association (1853). F. B. Bengier, F.C.S., 7, Exchange Street, Manchester.

NORTHAMPTON.—Pharmaceutical Association (1871). Mr. F. A. Ashton, 6, Regent Square, Northampton.

NOTTINGHAM.—Nottingham and Notts Chemists' Association (1863). Mr. C. A. Bolton, 40, Carlton Street, Nottingham.

OLDHAM.—Chemists' Assistants and Apprentices' Association (1870). Mr. C. G. Wood, Secretary, Church Institute.

PLYMOUTH.—Association of Chemists for Plymouth, Devonport, and Stonehouse (1868). Mr. G. Breeze, Catherine Street, Devonport.

PRESTON.—Pharmaceutical Students' Society. Mr. H. Denham, 8, Regent Street, Preston.

SCARBOROUGH.—Chemists' Association (1870). J. Whitfield, F.C.S., Scarborough.

SHEFFIELD.—Pharmaceutical and Chemical Society (1869). Mr. G. T. W. News-holme, 74, Market Place, Sheffield.

SUNDERLAND.—Chemists' Association (1869). Mr. J. Harrison, 33, Bridge Street, Sunderland.

TAUNTON.—Chemists' Association (1870). Mr. H. Prince, Fore Street, Taunton.

WOLVERHAMPTON.—Chemists and Druggists' Association (1874). Mr. W. I. Brevitt, Darlington Street, Wolverhampton.

YORK.—Chemists' Association (1865).

**PRESENTATION COPIES OF THE YEAR-BOOK OF PHARMACY ARE
FORWARDED TO THE FOLLOWING :—**

The Honorary Members.

Librarians.

American Pharmaceutical Association; Chemical Society of London; Ecole de Pharmacie, Montpellier; Massachusetts College of Pharmacy; The Mason's College, Birmingham; North British Branch of the Pharmaceutical Society; Pharmaceutical Society of Great Britain; Pharmaceutical Society of Ireland; Pharmaceutical Society of New South Wales; Ontario College of Pharmacy, Toronto; Pharmaceutical Society of Victoria; Royal Society of London; Société de Pharmacie, Paris; Yorkshire College of Science.

Provincial Associations (having Libraries).

Aberdeen Society of Chemists and Druggists; Arbroath Chemists' Association; Brighton Chemists' Association; Bristol Pharmaceutical Association; Colchester Association of Chemists and Druggists; Coventry and Warwickshire Pharmaceutical Association; Exeter Pharmaceutical Society; Glasgow Chemists and Druggists' Association; Halifax and District Chemists and Druggists' Association; Hastings Chemists' Association; Hawick Chemists' Association; Hull Chemists' Association; Leeds Chemists' Association; Leicester Chemists' Assistants and Apprentices' Association; Liverpool Chemists' Association; Manchester Chemists and Druggists' Association; Midland Counties Chemists' Association; Northampton Pharmaceutical Association; Nottingham and Notts Chemists' Association; Oldham Chemists and Druggists' Assistants and Apprentices' Association; Sheffield Pharmaceutical and Chemical Association; Sunderland Chemists' Association; Wolverhampton Chemists and Druggists' Association; York Chemists' Association.

Journals.

American Journal of Pharmacy; Archiv der Pharmacie; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; Lancet; Medical Press and Circular; Medical Times and Gazette; The Microscope; Nature; New Remedies; Pharmaceutical Journal; Pharmaceutische Centralhalle; Pharmacist; Répertoire de Pharmacie; Revista Farmaceutica.

THE FOLLOWING JOURNALS ARE RECEIVED FROM THEIR RESPECTIVE EDITORS :—

American Druggist; American Journal of Pharmacy; Archiv der Pharmacie; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; Pharmaceutical Journal; Pharmaceutical Record; Pharmaceutische Centralhalle; Pharmacist; Proceedings of the American Pharmaceutical Association; Répertoire de Pharmacie; Revista Farmaceutica.

PROGRAMME OF THE PROCEEDINGS
OF THE
BRITISH PHARMACEUTICAL CONFERENCE
AT THE
TWENTY-FIRST ANNUAL MEETING, HASTINGS, 1884.

OFFICERS.

President.

JOHN WILLIAMS, F.I.C., F.C.S.

Vice-Presidents.

(Who have filled the office of President.)

<p>Prof. BENTLEY, F.L.S., M.R.C.S., London. H. B. BRADY, F.R.S., F.L.S., F.C.S., New- castle-on-Tyne. THOS. B. GROVES, F.C.S., Weymouth. Prof. REDWOOD, Ph.D., F.I.C., F.C.S., London.</p>	<p>G. F. SCHACHT, F.C.S., Clifton, Bristol. W. SOUTHALL, F.L.S., Birmingham. R. REYNOLDS, F.C.S., Leeds. Prof. ATTFIELD, Ph.D., F.R.S., F.I.C., F.C.S., London.</p>
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Vice-Presidents.

<p>S. R. ATKINS, Salisbury. J. A. BELL, Hastings.</p>	<p>M. CARTEIGHE, F.I.C., F.C.S., London. J. R. YOUNG, Edinburgh.</p>
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Treasurer.

C. ECKIN, F.C.S., London.

Honorary General Secretaries.

F. BADEN BENDER, F.C.S., Manchester.
SIDNEY FLOWMAN, F.I.C., M.R.C.S., London.

Local Secretary.

F. ROSSITER, Hastings.

Other Members of the Executive Committee.

<p>BORLAND, J., F.C.S., F.R.M.S., Kilmar- nock. HILLS, W., F.C.S., London. KNYWORTH, G. A., F.C.S., Hastings. NAYLOR, W. A. H., F.C.S., London.</p>	<p>PAYNE, J. C. C., Belfast. RADLEY, W. V., Southport. STEPHENSON, J. B., Edinburgh. TAYLOR, G. S., F.C.S., London. THORPE, J. C., D.Sc., F.C.S., Burton.</p>
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Auditors.

<p>T. H. SYKES, Southport.</p>	<p>A. I. JOSEPH, St. Leonards.</p>
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Editor of Year-Book.

LOUIS SIEBOLD, F.I.C., F.C.S.

Secretary.

PHILIP PRINCEP.

Local Committee.

<p>AMCOCK, Mr. C., Hastings. BECK, Mr. A. N., Hastings. BELL, Mr. J. A., Hastings. BOLTON, Mr. F. P., Hastings. BRAILS福德, Mr. H., Battle. BROOKS, Mr. F., Hastings. DAVISON, Mr. W. H., Hastings. FRAYER, Mr. J., Hastings. HASSELBY, Mr. E. H., St. Leonards. JENNER, Mr. H. A., St. Leonards.</p>	<p>JOSEPH, Mr. A. I., St. Leonards. KNYWORTH, Mr. G. A., Hastings. LEMMON, Mr. G. F., Hastings. MACKENZIE, Mr. C. A., Hastings. MAGGS, Mr. S. B., St. Leonards. NEVE, Mr. F. C., St. Leonards. ROSSITER, Mr. F., Hastings. SMITH, Mr. A. W., Rye. TAYLOR, Mr. A., St. Leonards. THOMAS, Mr. H., St. Leonards.</p>
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THE SITTINGS OF THE CONFERENCE WERE HELD IN THE
ASSEMBLY ROOMS, CASTLE HOTEL, HASTINGS,

ON TUESDAY & WEDNESDAY, THE 12TH AND 13TH AUGUST, 1884,

Commencing at Half-past Ten a.m. each day.

MONDAY, 11th AUGUST.

The EXECUTIVE COMMITTEE met, according to notices from the Honorary General Secretaries, at 8 p.m., at the Castle Hotel.

TUESDAY, 12th AUGUST.

The CONFERENCE met at 10.30 a.m., adjourning at 1 p.m.; and at 2.30 p.m., adjourning at 5 p.m.

Order of Business.

Reception of Delegates.
Report of Executive Committee.
Financial Statement.
Report of Treasurer of the "Bell and Hills Library Fund."
President's Address.
Reading of Papers and Discussions thereon.

PAPERS.

1. *A Report on English Rhubarb.* By W. ELBORNE.
2. *Analyses of Rhubarb.* By W. ELBORNE.
3. *Final Report upon the Alkaloidal Value of Cultivated and Wild Belladonna Plants.* By A. W. GERRARD, F.C.S.
4. *Report upon the Estimation of the Alkaloids in Atropa Belladonna.* By WYNDHAM R. DUNSTAN, F.C.S., and F. RANSOM.
5. *A few Notes on the Growth of Belladonna and Hyoscyamus.* By T. J. HASSELBY.
6. *Report on an Investigation of the Chemistry, Botany, and Pharmacy of the Strychnos Nux Vomica.* By WYNDHAM R. DUNSTAN, F.C.S., and F. W. SHORT.
7. *Notes on the Estimation of Hydrocyanic Acid and Cyanides.* By L. SIEBOLD, F.I.C., F.C.S.
8. *Further Contribution to the Pharmacy of Linseed.* By T. GREENISH, F.C.S., F.R.M.S.
9. *Standardising of Pharmaceutical Preparations.* By G. F. SCHACHT, F.C.S.
10. *Standardized Pharmaceutical Preparations.* By D. B. DOTT, F.R.S.E.

There was a mid-day adjournment between 1 and 2.30 p.m., for luncheon.

Parties of members visited the Town Hall and other places of interest in the town and neighbourhood at 5 p.m.

WEDNESDAY, 13th AUGUST.

The CONFERENCE met at 10.30 a.m., adjourning from 1 p.m. till 2.30 p.m. The whole of the business of the Conference was completed this day by about 5 p.m.

Order of Business.

Reception of Delegates.

Reading of Papers and Discussions thereon.

PAPERS.

11. *A Fossil Aloe from the Wealden.* By G. A. KEYWORTH, F.C.S.
12. *On Hymenodictyonine, an Alkaloid from Hymenodictyon Excelsum.* By W. A. H. NAYLOR, F.C.S.
13. *Note on the Filtration of Lard.* By W. WILLMOTT.
14. *The Composition of Seidlitz Powders.* By W. MARTINDALE, F.C.S.
15. *The Pungent Principles of Plants.* By J. C. THRESH, D.Sc., etc.
16. *Note on a Specimen of Mylitta Australis.* By W. SOUTHALL, F.L.S.
17. *Note on Certain Anhydrous Essential Oils.* By J. WILLIAMS, F.I.C., F.C.S.
18. *Tincture of Quinine.* By R. WRIGHT.
19. *Note on China Bicolorata, or Tecamez Bark.* By JOHN HODGKIN, F.I.C., F.C.S.
20. *Analyses of some Old Cinchona Barks.* By DAVID HOOPER, F.C.S.
21. *Sesame Oil as a Basis for Lead Plaster.* By T. MABEN.
22. *Report upon the Strength and Condition of Commercial Specimens of Hydrargyrum cum Cretâ, Pilula Hydrargyri, and Unguentum Hydrargyri.* By M. DECHAN and T. MABEN.
23. *On Iodine in Cod Liver Oil and other Marine Products.* By E. C. C. STANFORD, F.C.S.
24. *Proximate Analysis of the Rhizome of Alpinia Officinarum (Hance).* By J. C. THRESH, D.Sc., etc.
25. *Note on Sulphurated Lime.* By T. S. DYMOND.
26. *The Estimation of Diastase in Extract of Malt.* By T. S. DYMOND.
27. *Report on Commercial Peruvian Balsam, and the Methods for Ascertaining its Purity.* By PETER MACLEWAN.
28. *Note on the Presence of Copper in some Pharmaceutical Preparations.* By J. R. HILL.

Place of Meeting for 1885.

Election of Officers for 1884-85.

There was a mid-day adjournment between 1 and 2.30 p.m., for luncheon. At 6 p.m. there was a dinner at the Castle Hotel.

THURSDAY, 14th AUGUST.

A considerable party of members, accompanied by the Local Committee, went on an excursion to Battle Abbey, Ashburnham, and Normanhurst.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING AT HASTINGS, 1884.

THE Twenty-first Annual Meeting of the British Pharmaceutical Conference commenced its sittings at the Castle Hotel, Hastings, on Tuesday, August 12th, Mr. John Williams, F.I.C., F.C.S., President, occupying the chair.

The following members and visitors were present during the meetings :—

Aberdeen—Kay, J. P.

Blackburn—Farnworth, Wm.

Bolton—Forbes, W.

Bonnyrigg—Hutchens, Wm.

Brighton—Savage, W. D.; Savage, W. W.

Brinkley—Keene, Mr. and Mrs. John.

Chester—Baxter, G.

Clifton—Schacht, G. F.

Doncaster—Hasselby, T. J.

Dover—Bottle, A.

Dublin—Wells, W. F., junr.

Edinburgh—Dott, D. B.

Glasgow—Frazer, D.; Kinninmont, A.

Gloucester—Meadows, N.; Stafford, Wm.; Ward, J.

Hastings—Beck, A. N.; Bell, J. J.; Bolton, F. P.; Keyworth, G. A.; Lemmon, G. F.; Mackenzie, C. A.; Rossiter, F.; Thorpe, G. A.; Vint, T. D.

Hurstpierpoint—Mitten, Miss Flora.

Kilmarnock—Borland, J.

Leeds—Jefferson, P.

Leicester—Clark, J. W.

London—Baldock, J. H.; Barnes, J. B.; Bindloss, G. F.; Bremridge, R.; Cooke, P.; Crawshaw, E.; Gerrard, A. W.; Glazier, W. H.; Greenish, T.; Holmes, E. M.; Lewinton, A. B.; Mait-

land, P. C.; Martindale, Wm.; Naylor, W. A. H.; Passmore, F.; Paul, B. H., Ph.D.; Piper, W. G.; Plowman, S.; Princep, P.; Redwood, Prof., Ph.D.; Taylor, G. S.; Thirk, S.; Tyrer, T.; Williams, J.; Willmott, W.; Winfrey, R.; Wrenn, W. A.; Wootton, A. C.; Wright, T. R.

Manchester—Benger, F. B.; Elborne, W.; Siebold, L.

New Barnet—Young, R. F.

Oldham—Glover, J. S.

Red Hill—Sillitoe, F. S.

Rye—Smith, A. W.

St. Leonards—Hasselby, E. H.; Joseph, A. I.; New, F. C.; Thomas, H.

Salisbury—Atkins, S. R.

San Remo—Squire, F. R.

Southport—Radley, W. V.

Teddington—Braby, F.

Tenbury—Slade, J.

Torquay—Riches, F.; Riches, T.

Tunbridge Wells—Dunkley, E.

MEETING OF THE EXECUTIVE COMMITTEE.

A meeting of the Executive Committee was held at the Castle Hotel, Hastings, on Monday, August 11th, at 8 p.m.

Present: J. Williams, F.I.C., F.C.S., President, in the chair; Messrs. Atkins, Bell, Borland, Keyworth, Naylor, Radley, Rossiter, Schacht, and Taylor; and Messrs. Benger and Plowman (Hon. Gen. Secs.).

The minutes of the previous meeting were read and confirmed.

The order in which papers should be read at the General Meeting was discussed, and the programme arranged. One paper was considered by the Committee unsuited for the objects of the Conference, and the Hon. Gen. Secs. were instructed to ask the author to withdraw it.

A draft report, for presentation at the Annual Meeting, was submitted by the Hon. Gen. Secs., and after some discussion and alterations was agreed to. In connection with that part of it relating to local expenditure, the local officers expressed themselves very pleased with the new arrangement, and said that it had relieved them of considerable anxiety.

The Treasurer's financial statement was approved.

The renewed invitation from Aberdeen to meet there in 1885

was considered, and it was resolved to recommend the General Meeting to accept the invitation.

Mr. Benger (Hon. Gen. Sec.) and Mr. Ekin (Treasurer) tendered their resignations. Many members urged them to alter their decision, and the Committee generally expressed great regret that the Conference was about to lose their invaluable services.

A list of proposed officers for 1884-5, was then adopted for recommendation to the General Meeting for election.

The manuscript of the *Year-Book* for 1884, as far as it could be completed, was laid on the table.

Power was given to the Hon. Gen. Secs. to remove from the list of members all who were more than two years in arrear, if they did not respond in a reasonable time to a circular which was being issued to them.

The Hon. Gen. Secs. reported that they had received from Mr. Shillinglaw, of Melbourne, nine decades of Baron von Mueller's "Eucalyptographia," which had been presented to the Conference by the Government of Victoria, at the suggestion of Mr. C. R. Blackett, President of the Victoria Pharmacy Board. The President was requested to suitably acknowledge the donation.

A letter of thanks from the Hawick Chemists' Association for the 1883 *Year-Book* was read.

The following new members were elected :—

Bolton, Mr. F. P., Hastings.
Brown, Mr. J., Chester-le-Street.
Burton, Mr. J., Llandudno.
Carteighe, Mr. J., London.
Corder, Mr. W. S., Sunderland.
Dechan, Mr. M., Hawick.
Davison, Mr. W. H., Hastings.
Dunkley, Mr. E., Tunbridge Wells.
Feaver, Mr. J., Hastings.
Fuller, Mr. J., Brixton.
Hall, Mr. H. S., Manchester.
Harrison, Mr. W., Headingley.
Jenner, Mr. H. A., St. Leonards-on-Sea.
Kay, Mr. J. P., Aberdeen.
Lemmon, Mr. G. F., Hastings.
MacEwan, Mr. P., Edinburgh.
Mackenzie, Mr. C. A., Hastings.
Maggs, Mr., junr., St. Leonards-on-Sea.
Mitten, Miss F., Hurstpierpoint.

Neve, Mr. F. C., St. Leonards-on-Sea.
Sainsbury, Mr. A. F., London.
Taylor, Mr. A., St. Leonards-on-Sea.
Thomas, Mr. H., St. Leonards-on-Sea.
Thompson, Mr. M. F., Glasgow.
Warrick, Mr. F. W., London.
Wiggs, Mr. H. J., London.
Wilson, Mr. J., Bath.

Alcazar, Mr. L. J., Port of Spain, Trinidad.
Blackett, Mr. C. R., Melbourne, Victoria.
Boland, Mr. A. E., Port of Spain, Trinidad.
Bourgeois, Mr. J. C., Sanfernando, Trinidad.
Bowen, Mr. W., Melbourne, Victoria.
Braddock, Mr. C. H., Adelaide, South Australia.
Clemes, Mr. A. B., Stawell, Victoria.
Cook, Mr. C., Sandhurst, Victoria.
Eyre, Mr. F. J., Adelaide, South Australia.
Fernandes, Mr. D., Bombay.
Francis, Mr. H., Melbourne, Victoria.
Given, Mr. H. B., Milparinka, N.S.W.
Goodwin, Mr. D. R., Tamworth, N.S.W.
Gransaul, Mr. A., Port of Spain, Trinidad.
Grogan, Mr. W. R., Bridgetown, Barbadoes.
Harrison, Mr. C., Prahran, Victoria.
Headding, Mr. C., Adelaide, South Australia.
Holdsworth, Mr. J., Sandhurst, Victoria.
Hood, Mr. R. W., St. George's, Grenada.
Hughes, Mr. R., Wangaratta, Victoria.
Huntsman, Mr. T., Fitzroy, Victoria.
Hutchinson, Mr. T. P., Woodstock, South Africa.
Lewis, Mr. G., Melbourne, Victoria.
Marston, Mr. G., Collingwood, Victoria.
Macgowan, Mr. J. T., Melbourne, Victoria.
Martin, Mr. B. R., Toronto, Canada.
Mills, Mr. W. H., Port of Spain, Trinidad.
Mercer, Mr. W., Daylesford, Victoria.
Noakes, Mr. E. T., Dandenong, Victoria.
Parker, Mr. J., Adelaide, South Australia.
Phillips, Mr. T., Inglewood, Victoria.
Plunket, Mr. C. T., Melbourne, Victoria.

Poole, Mr. H., Adelaide, South Australia.
Ramsey, Mr. P. A., Port of Spain, Trinidad.
Rawlins, Mr. S. A., Port of Spain, Trinidad.
Richards, Mr. A., Port of Spain, Trinidad.
Robinson, Mr. W., St. James's, Victoria.
Ross, Mr. W. C., Port of Spain, Trinidad.
Rowley, Mr. W., Melbourne, Victoria.
Saunders, Mr. W. B., Stayner, Canada.
Schaer, Prof., Neumünster-Zürich. .
Shillinglaw, Mr. H., Melbourne, Victoria.
Swift, Mr. G., Melbourne, Victoria.
Taitt, Mr. A. J., Port of Spain, Trinidad.
Whitfield, Mr. A., Longford, Tasmania.
Wigg, Mr. W. J., Maryborough, Victoria.

GENERAL MEETING.

Tuesday, August 12th.

Before the commencement of the proceedings,

The Mayor of Hastings, Mr. Alderman THORPE, briefly welcomed the Conference to the ancient borough, of which he had the honour to be chief magistrate.

Mr. J. A. BELL, Chairman of the Local Committee, begged to endorse the sentiments so heartily expressed by the Mayor. Although Hastings could not show any large chemical manufactories, it claimed to be second to no town on the south coast, and members of the pharmaceutical body in the town cordially agreed with him in welcoming the British Pharmaceutical Conference to Hastings. It was now twelve years since the Conference visited a south-coast town, and he had no doubt that wherever the Conference went it promoted that brotherly good feeling amongst pharmacists which he thought was as essential a feature as the increase of pharmaceutical knowledge, a brotherly feeling which ought to characterize all those engaged in a scientific business. He looked upon the chemist's business as being really a science, and the more deeply it was investigated, the more would this scientific character be appreciated. He was very glad to say that as a result of this visit a Local Association had been formed, which he believed would be appreciated by all the resident pharmacists. The rules had all been settled, and at a recent meeting he had received the honour of being elected the

first President. He could assure the members and the Conference that it would be his pleasure to promote anything which tended to improve the state of pharmacy and the welfare of the Association and the Conference.

The PRESIDENT, on behalf of the Conference, begged to thank both the Mayor and Mr. Bell for the kind manner in which they had expressed their feelings towards the Conference. He trusted this visit to Hastings would be of benefit to the pharmacists of the town and also to the advancement of science.

Mr. F. BADEN BENDER, F.C.S. (Hon. Gen. Sec.), then read the following letters of apology for non-attendance:—

LEEDS, *August 9th*, 1884.

DEAR SIRS,—

It is with much regret that I find myself unable to attend the meeting of the Conference at Hastings.

The programme of papers already announced is a guarantee of the interest of your discussions.

Is it not also fair to claim such contributions to Pharmacology as evidence that the class of men producing them is qualified to take an important share in the construction and periodical alteration of a national Pharmacopœia?

I feel the more sorry to be absent from the Hastings meeting because it will enjoy the many words of wisdom which I am sure our esteemed President will bring out of his unrivalled store of information on the relations of chemistry to pharmacy.

With best wishes for the success of the meeting,

I am, dear sirs,

Faithfully yours,

The HON. GEN. SECS.,

RICHARD REYNOLDS.

British Pharmaceutical Conference.

OBAN, *August 9th*, 1884.

MY DEAR MR. PRESIDENT,—

Having been actively engaged at each of the twenty-one annual meetings of the British Pharmaceutical Conference, I need scarcely assure you how much I regret being absent this year. Were I not certain that the Conference will go on increasing in prosperity and usefulness, I would not even now be away from the congenial society of its officers and members.

Yours faithfully,

JOHN WILLIAMS, Esq.

JOHN ATTFIELD.

He stated that similar letters had been received from Mr. C. B. Allen (London), Professor Bentley (London), Dr. Bernays (London), Messrs. J. L. Bullock (London), R. H. Davies (London), W. R. Dunstan (London), T. S. Dymond (London), C. Ekin (London), G. Ellinor (Sheffield), T. Farries (London), F. W. Fletcher (London), R. Hampson (London), F. J. Hanbury (London), J. R. Hill (Edinburgh), W. Hills (London), J. Hodgkin (London), T. Maben (Hawick), P. MacEwan (Edinburgh), J. C. C. Payne (Belfast), Dr. Quinlan (Dublin), Messrs. H. Rocke (Melbourne), W. Southall (Birmingham), E. C. C. Stanford (Glasgow), J. B. Stephenson (Edinburgh), Dr. Thresh (Buxton), Dr. Tichborne (Dublin), Messrs. C. Umney (London), and R. Wright (Buxton).

Mr. F. B. BENDER then read the following list of delegates from various societies. Some of them were unavoidably prevented from coming to the meeting, but the President welcomed collectively those present.

Pharmaceutical Society of Great Britain.—Mr. M. Carteighe (President), Mr. S. R. Atkins (Vice-President); Messrs. A. Bottle, J. Borland, T. Greenish, W. Hills, W. V. Radley, and G. F. Schacht.

North British Branch of the Pharmaceutical Society.—Messrs. J. Borland, D. B. Dott, D. Frazer, and A. Kinninmont.

Pharmaceutical Society of Ireland.—Messrs. J. C. C. Payne and W. F. Wells, Jun.

Aberdeen Society of Chemists and Druggists.—Mr. J. P. Kay.

Brighton Association of Pharmacy.—Messrs. W. D. Savage and W. W. Savage.

Bristol Pharmaceutical Association.—Mr. G. F. Schacht.

Dover Chemists' Association.—Messrs. A. Bottle and W. Wyles.

Glasgow Chemists and Druggists' Association.—Mr. A. Kinninmont.

Leeds Chemists' Association.—Messrs. P. Jefferson and G. Ward.

Liverpool Chemists' Association.—Messrs. A. C. Abraham, E. Davies, A. H. Samuel, R. Sumner, and Dr. Symes.

London Chemists' Assistants' Association.—Messrs. W. R. Dodd, J. O. Braithwaite, Flint, Flintan, Winfrey, and Wrenn.

Manchester Pharmaceutical Association.—Mr. F. Baden Benger.

Manchester Pharmacy Students' Association.—Mr. W. Elborne.

Sheffield Pharmaceutical and Chemical Society.—Mr. G. T. W. Newsholme.

MR. SIDNEY PLOWMAN (Hon. Gen. Sec.) then read the report of the Executive Committee, as follows :—

REPORT OF THE EXECUTIVE COMMITTEE.

Since the general meeting of the Conference last year, your Committee have met on several occasions for the transaction of business, and now lay before the members an account of the work done on their behalf.

In accordance with the generally expressed wish of the Southport meeting, it was decided at a meeting of the Executive Committee, on October 3rd, 1883, that the two presidential addresses delivered by Professor Attfield, F.R.S., should be distributed to members of both Houses of Parliament, either directly or through gentlemen personally acquainted with members of Parliament. Further, that Messrs. Butler & Tanner, the printers of the *Year-Book*, should be empowered to supply at a fixed rate to applicants reprints of the addresses with added press notices. A sub-Committee, consisting of the President, Professor Attfield, and the Honorary General Secretaries, was appointed to arrange details. As a result every member of both Houses of Parliament has received the two addresses, and about 10,000 copies have been supplied by Messrs. Butler & Tanner for private distribution.

In the last report of the Executive Committee, it was stated that some correspondence had taken place between the Honorary General Secretaries and certain gentlemen residing in the colonies and India, with a view to their appointment as Honorary Colonial Secretaries. Full replies having since then been received, the following appointments have been made :—

Honorary Colonial Secretaries.

- For *Bengal*.—C. N. Kernot, M.D., etc., Calcutta.
,, *Bombay*.—D. S. Kemp, Bombay.
,, *Canada*.—H. S. Evans, F.C.S., Montreal.
,, *Cape Colony and Natal*.—A. Walsh, Port Elizabeth.
,, *New South Wales*.—L. B. Bush, Bathurst.
,, *New Zealand*.—T. M. Wilkinson, Dunedin.
,, *South Australia*.—J. Parker, Adelaide.
,, *Tasmania*.—A. P. Miller, Hobart.
,, *Victoria*.—H. Shillinglaw, Melbourne.
,, *West Indies*.—W. C. Ross, Port of Spain.

Since their appointment a very large amount of correspondence has passed between them and the Honorary General Secretaries as

to the best method by which the interests of the Conference could be promoted in the colonies.

The outcome of this was that three thousand circulars, fully setting forth the objects of the Conference, have been sent out to the Colonial Secretaries for distribution in their respective colonies, and they have been requested to stimulate research by endeavouring to obtain papers for the annual Conference meetings. Replies are not yet complete, since a comparatively short time only has elapsed since the issue of the circulars; but so far the results are most gratifying. Mr. Shillinglaw has sent the names of a number of new members, and has promised further considerable additions to the list. As a contribution to the Conference, he has sent nine decades of Baron von Mueller's "Eucalyptographia," presented by the Government of Victoria, at the instance of Mr. C. R. Blackett, President of the Victoria Pharmacy Board, with the promise of any subsequent decades which may be published. Mr. Ross has sent a number of names from Trinidad and the West Indies. Mr. Evans has promised a large number from Canada, and Mr. Miller has sent from Tasmania a fine specimen of native bread (*Mytilus Australis*), weighing 37 lbs., a paper on which will be read at the meeting by Mr. W. Southall, F.L.S. These donations have been suitably acknowledged by the President on behalf of the Conference. All the newly-appointed Colonial Secretaries have promised to use their personal influence in furthering the objects of the Conference, and in inducing colonial pharmacists to join it.

Your Committee feel assured that by these appointments, not only will pharmacy itself be advanced, but that brotherly good feeling will be promoted, and mutual goodwill secured among English-speaking pharmacists in all parts of the empire.

For the second time in its history the Conference this year does not meet at the same time and place as the British Association.

On the first occasion the meeting was held in London, so that it was then difficult to form any judgment of what would be the result to the Conference if it ceased to meet at the same time and place as the Association. Your Committee have frequently deliberated upon this question, and now invite expressions of opinion from members, as to the desirability of continuing or abandoning the practice. An opportunity will be afforded them of stating their views on this subject at the termination of the proceedings on Wednesday.

Another new departure is made this year in the matter of the entertainment of visitors by the Local Committee. This object

has also been frequently debated and permissive resolutions passed ; but at a meeting of the Executive Committee, held on December 19th, 1883, the following resolution was carried :—

“ That in future the members attending the meetings of the Conference shall pay for the luncheons, etc., supplied to them during the business days of the meetings, and that if excursions be organized by the local members on the following days, all railway or other fares shall be paid for by the members attending those excursions.”

Your Committee have noticed with concern that the entertainment of visitors had a tendency to become more lavish year by year, and that the cost might become a serious burden not only to local pharmacists, but to those residing a considerable distance from the place of meeting.

In the interest of the Conference, therefore, your Committee felt that it was necessary to do something to check the generous impulses of local committees.

Should the Conference at any time decide to abandon the practice of meeting at the same time and place as the British Association, your Committee think it possible that under the altered conditions a visit of the Conference might be welcomed by many towns in the kingdom.

Already one of the objects of the Conference has been fully attained by its proposed meeting in Hastings. At the time the invitation was sent there was no association of chemists and druggists in the borough ; but since then, as a result of the visit of the Conference, one has been formed, and the usual grant of books from the Bell and Hills Fund has been made. The books are now on the table for the inspection of members.

It is with very great regret that your Committee have to announce that the Conference is about to lose the valuable services of Mr. F. Baden Benger as Honorary General Secretary, and of Mr. Ekin as Treasurer. Mr. Benger has served the Conference for thirteen years and Mr. Ekin for seven years.

Your Committee feel that they cannot adequately express in words their sense of the loss the Conference sustains by their resignation.

Five reports upon subjects for the investigation of which money grants have been made will be presented to the meeting, and twenty-three papers on other subjects will be read, making a total of twenty-eight communications.

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Mr. H. G. Greenish has unfortunately been prevented from completing his work on *Nerium odorum*, but hopes to present a final report on the subject at the next meeting of the Conference.

Your Committee regret that no application for a grant in aid of research has been made during the past year. They would again remind members that there is a fund for the purpose of defraying the cost of material, etc., used in the prosecution of suitable investigations; and they venture to hope that several applications for grants will be made during the forthcoming year.

Mr. Louis Siebold, F.I.C., F.C.S., was last December re-appointed Editor of the *Year-Book*, and the manuscript for the next issue, as far as it can be prepared, is now on the table.

Since the last general meeting of the Conference, 102 members have been elected; of these 54 are home members, of whom 9 are from Hastings, and 48 reside in the colonies and abroad.

Mr. F. BADEN BENDER (Hon. Gen. Sec.), in the absence of the Treasurer, read the following Financial Statement:—

FINANCIAL STATEMENT FOR THE YEAR ENDING JUNE 30TH, 1884.

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

1883	Dr.	£	s	d.
To Balance in hand		222	1	0
„ Sale of Year-Book by Publishers		21	0	0
„ Sale of Year-Book by Secretary		6	7	6
„ Advertisements, 1883 vol.		95	12	9
„ „ 1882 vol.		15	1	6
„ „ 1881 vol.		1	14	0
„ Subscriptions from Members		723	3	4
July. To Dividend on £250 Consols		3	13	5
1884.				
Jan. „ „		3	13	5
June. To Sale of £250 Consols		248	15	0
		<hr/>		
		£1341	1	11
		<hr/>		

	Cr.	£	s.	d.
By Expenses connected with Year-Book:—				
„ Printing, binding, and distributing	£504	4	6	
„ Editor's Salary	150	0	0	
„ Advertising and Publishers' charges	31	1	6	
„ Foreign Journals	5	4	6	
				<hr/>
				690 10 6
„ Secretary's Salary (Mr. Princep)				100 0 0
„ Printing and Stationery				85 0 8
„ Sundry Expenses				7 7 5
„ Postage.				98 3 2
„ Addressing Circulars				5 1 0
„ Expenses of Southport Meeting				9 17 0
„ Secretary's Expenses (Mr. Princep) ditto				6 0 0
„ Grant to Mr. Elborne				2 2 0
„ „ Messrs. Dunstan & Short				5 0 0
„ „ Messrs. Dunstan & Ransom				5 0 0
„ Cheque Book				0 4 2
„ Balance at Bank	£323	10	6	
„ Cash in Secretary's hands	3	5	6	
				<hr/>
				326 16 0
				<hr/>
				£1341 1 11
				<hr/>

Assets July 1st, 1884, Cash . . . £326 16 0

The Bell and Hills Fund.

	Dr.	£	s.	d.
1883. To Balance in hand		25	16	10
July. To Dividend on £350 Consols.		5	2	10
1884.				
Jan. „ „ „		5	2	10
				<hr/>
				£36 2 6
				<hr/>

	Cr.	£	s.	d.
By Purchase of Books for Southport		10	5	9
„ Balance at Bank		25	16	9
				<hr/>
				£36 2 6
				<hr/>

Assets July 1st, 1884 { Cash £25 16 9
 { Consols (stock) 350 0 0

Audited and found correct { T. H. SYKES, Southport.
 { ARTHUR I. JOSEPH, St. Leonards-on-Sea.

The PRESIDENT moved the adoption of the report and accounts.

Mr. SAVAGE (Brighton) seconded the motion.

Mr. BOTTLE (Dover) asked if the sale of £250 Consols was to be taken as an indication that the funds of the Association were not in as good a state as in the previous year, or was it in consequence of any exceptional expenditure.

Mr. BENDER (Hon. Gen. Sec.) said the expenses had been rather exceptional this year, arising in the first place from the issue of an appeal such as it was usual to send out every few years, and which this year had been extended to the colonies, the returns from which had not yet fully come in, although £65 more had already been received this year in subscriptions than last. Secondly, there had been the additional expenditure incurred in issuing Professor Atfield's address to members of Parliament. They had really spent about £150 more this year than last, and there was every reason to believe it would all come back.

The motion was then put and carried unanimously.

The PRESIDENT then delivered the following address:—

THE PRESIDENT'S ADDRESS.

It is my duty to welcome the members of the British Pharmaceutical Conference to the present meeting, which I trust will prove, like many previous ones, to be both pleasant and profitable. On this occasion the Conference assembles under somewhat unusual circumstances. Hitherto it has met year after year, with only one exception, in the same town as the British Association, and as many members of the Conference are also members of the British Association, the arrangement doubtless is a convenient one.

The more extended flight of the British Association this year to Montreal,—where I hope it will have a most successful meeting,—has, however, given the Conference an opportunity of visiting this pleasant and prosperous town of Hastings, an opportunity which might not have occurred for many years had the old order of the Conference always holding its meetings in the same town as the Association been adhered to.

The office of President of the Conference was accepted by me very reluctantly, and only in consideration of the very unusual nature of the present meeting. Whilst believing that I shall receive the indulgence of the members in my attempt to fill the office, I cannot expect to do so in an altogether satisfactory way; and when I look back at the list of names of those who have per-

formed its duties with such distinguished ability, I must say that, even while I write, my courage seems to ooze out at the end of my pen. But I must do my best, and trust to your kind forbearance in allowing for my many faults and shortcomings.

It is sometimes useful to rest and look round at what the world of science has been doing. Perhaps, therefore, you will bear with me while I allude to a few points which strike me, and which seem to have a bearing, more or less remote, upon those branches of science with which we, as a body, are more particularly connected.

A few years ago, if I had been asked what was the leading characteristic of chemical investigation, I think I should have answered, The development of our knowledge of coal-tar products, and more especially concerning the many and beautiful colours derived from them. This study has not only had a most important bearing upon the technical and industrial application of scientific knowledge, but it has also led to the establishment of abstract scientific theories of the greatest importance. It is true that this great wave of thought and investigation may not appear to have influenced directly, to any great extent, the subject in which we are most nearly interested, namely, pharmacy. Still, this, like all other true knowledge, will indirectly produce an effect which may yet be found of great importance in the practice both of medicine and pharmacy. Indeed, it should not be forgotten that the very commencement of the knowledge of the coal-tar colours was derived from a research undertaken by the illustrious Dr. Perkin, at the instigation of my much-valued old friend, Dr. Hofmann, to build up quinine artificially. It is true the proposed result was not obtained, but another; this, however, though for a time quite neglected, has since proved most momentous. I think, therefore, we may claim that pharmacy has had a share in instigating this most important development of chemical knowledge.

Notwithstanding that Perkin's attempt to effect the synthesis of quinine was in this respect a failure, the artificial formation of the vegetable alkaloids and acids has remained a branch of research regarded by pharmacists with very great interest. Foiled in their first attempts to build up various compounds by comparatively direct combination, chemists have shown in their later researches a tendency to commence their work with careful experiments, having in view to throw light upon the rational composition of the bodies they seek to form. These researches have not been unfruitful,

in that they have rendered more or less practicable the artificial production of representatives of several natural organic compounds. Moreover, although they have not up to the present time led to the complete synthesis of any vegetable alkaloid, they have yielded extremely interesting and useful information concerning the constitution of these important bodies; whilst the natural bases have been supplemented by a large number of artificially formed basic substances, some of which have already found a place in medicine. Thus Hofmann has shown that piperine, the alkaloid of pepper, can be built up from pyridine, a coal-tar base, and that piperidine, one of the intermediate compounds, which is also obtained with piperic acid when natural piperine is split up by potash, is probably a stepping-stone to the formation of conine and atropine, with the former of which it is homologous. Ladenburg has reduced the number of Solanaceous mydriatic alkaloids to two,—atropine and hyoscyamine,—and shown that one is convertible into the other, and that the basic nucleus, tropine, common to both of them, is capable of combining with acids to form a whole series of new compounds, one of which, homatropine, has already been put to practical use. Turning to another important alkaloid, Grimaux has confirmed a previous suspicion that in some respects morphia behaves as an alcohol, and that by treating it for the introduction of a methyl group in the place of a hydroxyl group, morphia can be readily converted into codeia. The identity of the substitution product with codeia, was at first questioned by the celebrated German chemist, Hesse; but Grimaux's statement was confirmed by a member of this Conference, Mr. D. B. Dott, of Edinburgh, and it is now admitted that codeia is a monomethyl ether of morphia, Hesse having been temporarily misled by the formation of some dimethyl-morphia. In a similar way, it has been shown that caffeine may be obtained from theobromine, and theobromine from xanthine, by the introduction of successive methyl groups; whilst xanthine itself is derivable from guanine, a constituent of guano. Even while I write it is announced that the complete synthesis of xanthine has been effected by Gautier; so that if these various statements are correct, we appear to be within sight of the production of caffeine artificially.

Chinoline is a product of coal tar, but was originally produced by the destructive distillation of cinchonine, quinine, etc. The two products, although nearly identical, can, however, be distinguished by careful comparison. Chinoline is a powerful base, and one of its salts, the tartrate, has been largely employed in medicine. Chino-

line has doubtless great activity, and in some of its characters it appears to coincide in medicinal activity to quinine, but in a different, or we might say uncontrollable, manner. Still more lately the so-called "kairine," which is really a salt (the hydrochlorate) of a methyl substitution compound of chinoline, and appears to possess very considerable activity, has been employed in fever cases to reduce the temperature of the patient. But there appears to be some evidence that the power of the remedy is gradually changed or reduced by keeping, and that after a time—at present undetermined—its action is very different from that of the freshly prepared article. This would be, if correct, a serious consideration, and would tend to prove that the constitution of this artificially produced substance is very different in its nature to that of an alkaloid produced by natural means.

Chemical investigators have also been devoting much attention to explosive substances. Now, as most of these are nitro substitution compounds, it is hardly surprising to find that among them are substances that have proved capable of acting as potent remedies in the hands of medical men, when manipulated and brought into convenient form for administration by pharmaceutical skill. Need I say I allude to the introduction of such bodies as nitroglycerine and nitrite of amyl into the field of practical medicinal agents?

These instances will suffice to show the nature of the information that has been gleaned and some of the contributions that have been made to our store of available medicinal agents whilst working out the synthesis of organic compounds and other great chemical problems. It will be of at least equal interest to devote a few moments to the consideration of some of the artificially formed substances that have been put forward as representatives of natural compounds. I may say at once that, in my opinion, the results hitherto obtained are not of a very conclusive character; in fact, I think there is some reason to doubt if any of the products produced by artificial means are actually identical with the natural products. Even those bodies produced artificially, like benzoic or salicylic acid, which chemically approach so nearly to the bodies produced naturally as to be hardly distinguishable from them, appear to have not quite the same action medicinally. This is, of course, a very serious question for medical men, and in a subordinate way for pharmacists.

For instance, it is stated that benzoic acid and its salts, produced artificially from naphthalene, are not medicinally active like the

acid produced from gum. This may be due to the fact of the latter acid containing a large percentage of cinnamic acid, and it has been argued that it owes its medicinal activity to that acid. But cinnamic acid itself has been made artificially for some time, and this also is said to be inert. Further, the therapeutical action of resin benzoic acid has also been attributed to the empyreumatic compound which sublimes with the acid and imparts colour to it, but this too appears to have been disproved by some recent experiments in Germany.

Salicylic acid, again, I have myself some knowledge and experience of, and I find that in the opinion of many medical men there is an essential difference in the medicinal activity of the natural acid produced from wintergreen oil, and of that produced artificially from carbolic acid. It is possible that this difference may be due to some trace of impurity still retained by the artificial acid, though I think I ought to mention that a very great improvement has taken place in the appearance and quality of the artificial acid since, in 1878, I pointed out the great difference which then existed between the acid made from carbolic acid and that produced from wintergreen oil.

Within the last few months my attention has been drawn to a new source of salicylic acid, namely, the oil of sweet birch (*Betula lenta*). This oil appears to be sometimes used as an adulterant of the true gaultheria oil. It seems to contain a large percentage of methyl salicylic acid, but without the peculiar terpene so characteristic of the true wintergreen oil. There are also other plants that have been reported to yield similar oils, and these appear worthy of more attention than they have yet received. For instance, about thirteen years since, Mr. Broughton reported that he had examined an essential oil obtained from an Indian plant (*Andromeda Leschenaultii*), and found it to be almost identical with oil of wintergreen. So plentiful is this plant in the hill districts, that Mr. Broughton seems to have seriously contemplated the utilization of the essential oil in the economical manufacture of carbolic acid by the decomposition of the methylsalicylic acid contained in it. Shortly afterwards, Dr. de Vrij stated that whilst in Java he had obtained an almost identical oil from the leaves of *Gaultheria punctata* and *G. leucocarpa*. With respect to sweet birch oil, some experiments have already been made in the preparation of salicylic acid from it, but at present I am not in a position to say whether there is any difference between the medicinal activity of the product and of that obtained from oil of wintergreen. I am, however, endeavouring to obtain a supply

of undoubtedly genuine birch oil, with which I hope to be able to decide whether there is any real difference between samples of salicylic acid produced from the two oils, or whether such difference as I have observed is simply due to some impurity in the oil I have been working with. I am also anxious to obtain samples of the oils from the sources mentioned by Mr. Broughton and Dr. de Vrij, as these would enable me to carry out a more complete series of comparative experiments.

Great and important as the question may be as to the possibility of the artificial production of organic principles which shall be chemically and medicinally identical with those formed naturally, it is only part of a still larger subject—the life-history of the plant or animal organism. This possesses great interest for all, and it must be admitted that a great deal has been done during the last few years to throw light upon this department of knowledge. But as, in order to constitute anything like conclusive evidence, numerous and extensive observations are indispensable, so the number of patient, painstaking, and at the same time accurate observers, cannot be too great. As marking an important step in knowledge, I may allude to the researches lately instituted to determine the rate of absorption of water by a plant, which appear to prove that that rate is very much in proportion to the dryness of the surrounding atmosphere, and is regulated by the amount of evaporation from the surface of the leaves.

Another series of observations, made by Professor Sachs, also appear to me to be of very great interest, not only to the professed botanist, but to the pharmacist. Professor Sachs has been engaged in the study of the rate of formation and disappearance of starch in the leaves of growing plants, and as the process for conducting these researches, unlike those for determining the amount of absorption of water by the living plant, is easy to carry out, and requires little or no apparatus, I think I may venture to describe it more in detail, as perhaps some present, especially those who reside in country districts, might be inclined to assist in this research by their own observations.

The leaf to be examined is first plunged into boiling water for about ten minutes, then taken out and digested in alcohol for about the same time (I find methylated spirit answers perfectly well). This treatment extracts the whole of the colouring matter (chlorophyll) and leaves the leaf perfectly white. The leaf is now placed in an alcoholic solution of iodine, and the presence or absence of starch is demonstrated in a few minutes. The absorption of iodine

commences at the edges, and soon colours the leaf blue-black if much starch be present, or brown if the quantity of starch be but small. The venation of the leaf appears as a pale network upon a dark ground, rendering it a very beautiful object; but all my efforts to preserve the specimen beyond a few hours have hitherto failed.

The curious and interesting information obtained from these researches is, that the amount of starch present in the leaf of any given plant varies considerably under different circumstances. In direct sunshine, and under otherwise favourable circumstances, starch is formed very rapidly; but it generally disappears entirely during the night, so that a leaf collected in the evening will prove full of starch, while another leaf of the same plant collected before sunrise will not show a trace.

It is also an interesting fact, but one we should quite anticipate, that if the air surrounding the plant is deprived of its carbonic acid by means of caustic soda, no production of starch takes place, even in direct sunshine, and with warmth and moisture that would under other conditions be sufficient.

Again, the gradual increase in the quantity of starch produced during the day and under specified conditions is a matter of great interest, as it would point to certain times and conditions when the plant would probably be more vigorous, and the activity of its medicinal principles greater than at some other time. We already recognise the importance of plants intended for medicinal use being collected at certain periods of growth, but it is possible that we have something to learn upon this subject.

I fear in these later days pharmacists have rather gone backward than forward in such knowledge. The apothecary, herbalist, or simpler of two hundred years ago appears to have taken many and—to our modern way of thinking—some very foolish precautions in this matter. We now, I fear, practically take none, but rather leave everything to the knowledge and care of those who grow and supply such medicinal plants in a wholesale way. Perhaps the fact that some of our indigenous plants, once held in high repute, are now practically cast on one side, may be due in some degree to the difference in the care and knowledge with which such plants have been collected. My learned predecessor in this chair, Professor Attfeld, suggested, I think, that pharmacists should grow their own plants. I would not go as far as that, as I fear the results would even then not be satisfactory, either in a medicinal or pharmaceutical sense; still, if by any means we could

add to our knowledge of the best mode of cultivation or collection of medicinal plants, we should be doing a service both to the public and ourselves.

By what means light effects the transformation of carbonic acid and water into starch is not known, although it is known that chlorophyll plays an important part in the reaction. But the influence of light in producing chemical change and combination is at once one of the most wonderful and inexplicable of phenomena. Photography has popularized this subject, though I need not venture to dilate upon that most fascinating art, for we constantly find the influence of light in chemical reactions of still nearer interest to the pharmacist.

A few years ago a demand arose for dichloride of ethidene. Unfortunately this demand came in the winter, when little light—sunlight especially—was available in England. The compound is produced by the combination of chlorine with chloride of ethyl, both in the gaseous state, but the action can only be started or maintained under the influence of sunlight. Consequently on dark, cloudy, or foggy days it has been found impossible to continue the manufacture of the compound. This is one of many instances which might be mentioned in which light proves itself to be of active and positive use to the chemist. And it is possible that in the future many other reactions will be conducted under its influence. Last, but not least, light is the great disinfectant.

Probably the most striking chemical, or rather I suppose I should say physical, results that have been obtained in recent years, have been those following upon the many and startling experiments on gases conducted under immense pressure and at very low temperatures. In these experiments advantage is taken of the fact that certain liquids boil at very low temperatures, especially when *in vacuo*, and obviously in becoming converted into vapour take up heat from surrounding matter to a large extent. In fact, working under these conditions with liquid carbonic anhydride and liquid ethylene (the chief illuminating agent of ordinary coal gas), such temperatures as -80° to -115° C., or even -140° C. have been arrived at, and it is asserted that as low as -200° C. has been reached by allowing liquid oxygen to boil *in vacuo*. In a lecture lately delivered at the Royal Institution, Professor Dewar exhibited alcohol in a gelatinous condition, and bisulphide of carbon in a solid state, and was even able to show to a few of those present liquid oxygen. Even in the short interval since then the manipulation has been very much simplified and brought

within the range of an ordinary laboratory operation. M. Cailletet has announced that marsh gas, under only a slight pressure, if submitted to the refrigerating influence of ethylene boiling at ordinary atmospheric pressure, is converted into a liquid that in vaporizing produces a degree of cold in which oxygen is at once liquefied, without the necessity for elaborate apparatus for submitting it to pressure.

It is with almost a feeling of regret that we hear of the results of these extraordinary experiments. Probably we have all agreed in a general way that at some temperature or under some pressure the so-called permanent gases would become either liquids or even solids; but it is almost startling to find the thing done, and our old refractory friends brought down to the level of ordinary matter. It is also interesting to mark how near the normal temperature appears to be to that temperature at which such a gas as oxygen becomes a liquid or even a solid; for *minus* 200° C. seems but a little way down, if we compare it with *plus* 2000° C. Even at *plus* 2000° C., which is a temperature we can certainly reach, many of our most familiar elements and compounds would not liquefy, while as to the temperature at which, say, iron or platinum becomes gaseous, we must turn to the astronomer, who will tell us of temperatures in the sun many hundred times higher than the highest point we can ever expect to reach by our ordinary means upon the surface of this earth. Considering this great distance between the extremes of known temperatures, it does strike one with something like astonishment to remember that life, both vegetable and animal, is pretty nearly limited to the comparatively small range of temperature within which albumen and protein, and such compounds generally, are capable of existing without coagulation or change of physical properties,—say between zero and 75° C.,—certainly not far beyond these limits. I say it does somewhat startle one to find that we are existing as it were nearly at the bottom of the heat range, and that matter, even in the form of such gases as oxygen and nitrogen—in other words, the very atmosphere we breathe—would by a reduction of temperature, comparatively small as compared with the high temperatures known to exist, become solid matter. However much we may have been prepared to admit the possibility of such a state of things, we are hardly prepared to find it so close to our elbows.

This liquefaction and solidification of some of the gases is likely to prove of great practical use, both to pharmacists and chemists and to the public generally. Anhydrous sulphurous acid gas

readily condenses under a pressure of about three atmospheres to a liquid, and in this state can be put up into syphon-vases to be drawn upon as required. This method is, I understand, coming into considerable use with brewers and others, who use the gas for checking fermentation. To the pharmacist it will probably prove a very handy and useful mode of keeping the acid, rather than in the form of a solution, in which condition sulphurous acid is liable to oxidize and spoil; whilst solutions, either in water or alcohol, can be readily prepared from the liquid acid as required.

Carbonic anhydride, also in the liquid state, is now being supplied in strong cylinders, and is coming into use, I understand, for charging beer, wine, etc., with carbonic acid gas. Further, it is said that in Berlin the snow-like solid carbonic acid, with which most here are familiar, is brought into a more compact form by placing it in cylinders and subjecting it to great pressure. Under this treatment the acid becomes hard and brittle, something like marble in appearance, in which condition it might be handed round at a dinner-table, and each guest chipping off a portion could effectually, not only cool his wine, but at the same time charge it with the agreeable carbonic acid. I do not know if the price at which the liquid acid can be produced can be brought down to suit the makers of aerated waters; if so, it may prove a very convenient and useful invention to many pharmacists, who only require to make small quantities of lithia, potash, or other medicated waters.

Although somewhat beyond the usual range of subjects immediately interesting to pharmacists, we cannot but recognise the vast importance of the researches and enormous advances science is making in the detection of the probable causes of zymotic diseases. To Pasteur in France, to Koch in Germany, and to Klein and others in England, much is due, and we look for a further development of their researches with profound interest. It is not by any means improbable that one of the ultimate results of these researches may be to make great changes in the application of remedies to the classes of disease alluded to. And pharmacists may be called upon to undertake the preparation of remedies possibly of a character at present little thought of, at any rate in England. For instance, on the Continent, oxygen is now administered as a gas in certain forms of disease. Already, too, the preparation of vaccine for sale to farmers as a prophylactic against *charbon*, or splenic fever, in sheep, is carried out on commercial principles in France, and it is quite possible that a vaccine against hydrophobia may soon be in the market. There is no doubt also that the introduction of new dis-

infecting and antiseptic agents is likely to receive greater attention in the future than it has ever in the past, important as the subject is already acknowledged to be. I imagine a great future is still in store for the production and utilization of articles of this nature, a subject which must be of the greatest interest to the pharmacist as well as to the medical man and sanitary inspector.

The last year has also been distinguished by a development of peculiar interest to pharmacists. I allude to the production of several pharmacopœias. Indeed, it is curious, but not unnatural, that in the great centres of civilization throughout the world the same feeling appears to have prevailed, namely, that the national pharmacopœias of the various States required revision; that the old ones were unsatisfactory, and not up to the mark required by modern medical science.

New pharmacopœias have accordingly appeared in America, Germany, and France, and it is no secret that England is to be favoured with a new pharmacopœia shortly. It is not my intention to enter into any critical examination of these works. I rather allude to them as proving the great and living interest taken at the present time in matters pharmaceutical. Excellent articles, with copious extracts, have appeared in the *Pharmaceutical Journal* and elsewhere, giving a good idea of the nature of the contents of these works to those who have not had time or opportunity of studying the originals. As these works emanate from countries very distinct in social and intellectual conditions, so we find in them marked differences in the treatment and manipulation of drugs and chemicals. Probably from our own peculiar standpoint we can find fault with some details in all these works; but taking them as a whole, I think there can be no question that a great advance is shown. I trust that when our new national pharmacopœia appears, we shall be able to congratulate the compilers of that work in a similar way; but we naturally feel anxious, and should be glad if we had some guarantee that the practical part will be as completely done as there is no doubt the theoretical part is sure to be. Speaking generally of the three works referred to, the American Pharmacopœia might be described as too diffuse, the German as too scientific, and the French as too special; but there is no doubt that from each many valuable hints and processes can be obtained. The question of the admission of new remedies into national pharmacopœias, and the exclusion of old remedies that have become obsolete, requires great caution and consideration. It is quite proper that a new and useful remedy should be added as soon as

possible to a national pharmacopœia, so as to define its strength, properties, etc. But experience teaches us that many remedies introduced fail from some cause to justify their inclusion in such a work, and it therefore follows that the lapse of sufficient time must be permitted before the final position of a new remedy can be settled. There is also a difficulty in removing an old remedy, which ought to be borne in mind. The influence of a pharmacopœia is not only felt in its own country, but frequently far away also, as many of the more distant centres and colonies accept the articles authorized in a European pharmacopœia, and continue to use them long after their popularity has waned at home. I was struck a short time back by a remark by the editor of the *Pharmaceutical Journal* respecting the retention of kermes mineral in the new French Codex. It is true that that particular preparation is but seldom prescribed now, I suppose I may say in France, certainly very seldom in England. Still, it is in large demand in South America, where the French Codex is accepted as an authority—and I am sorry to say the British Pharmacopœia is not. Bearing in mind also that a pharmacopœia is often appealed to in courts of law, it is of great importance that both additions and withdrawals should be effected with great discretion, as frequently questions may arise which will give rise to great trouble and confusion in the legal mind.

This leads me to allude to what is really a most important function of the modern pharmacopœia. I allude to the tests for the quality of drugs and the purity of chemicals which it may contain. It is admitted by all that the greatest care and attention should be given to matters of this kind, but some judgment and discretion must be shown. If the description of a drug be based upon a rare and almost unique specimen, it is obvious that it will be impossible to maintain such a standard of quality in the ordinary course of pharmaceutical practice. So, too, if the tests given for a chemical preparation are so refined as not to make allowance for obvious and practically non-important impurities, great and unnecessary increase of cost might have to be incurred in the preparation of such articles without a corresponding advantage to the public. I was pleased to find that this point had not been lost sight of in the new French Codex, where impurity and adulteration are separated and treated apart. To give one instance, cream of tartar is described as containing tartrate of lime as an impurity; but silica, alum, etc., are mentioned as adulterants, and not to be permitted. This, I think, is a sensible and proper plan. All natural cream of tartar must contain

a certain percentage of the lime salt. If it is required free from lime salt, it must be prepared from tartaric acid, and the product must of necessity be far more costly, although no better for medicinal purposes. Under such a definition as that in the Codex no magistrate or justice would convict a chemist for selling a natural cream of tartar as an adulterated article; whereas the adoption of strict chemical tests only, without any allusion to natural impurities as such, might lead to inconveniences such as, I am afraid, have before now resulted from the British Pharmacopœia not having recognised facts, although distinctly describing the ordinary natural article as the official preparation.

This brings me naturally to the question of the proper system under which a new British Pharmacopœia should be compiled, to which subject permit me to claim your attention for a short time. That a new pharmacopœia is required is agreed upon by all, and we understand that the General Medical Council, which is the body at present entrusted by law with the responsibility of the production of the work, is engaged in, or has given directions for, its production in due course. I may also remind you that we, as pharmacists, have put forward a very strong claim to be officially recognised and to be permitted to take our share in the responsibilities of the production of this most important work. We claim the position on many grounds, and it has appeared to me unaccountable that our claim has not been cordially responded to, both by the Government and the medical authorities. One, and I would say a foremost ground for our making this claim, is that we are a branch (although admittedly an humble one) of the great profession of healing, and that our special branch of that profession is exactly that concerned in the production of a National Pharmacopœia. Not only is this our special province, but we claim it also on account of our special knowledge. I do believe and assert that pharmacists as a body know more about the best modes—or I may say the practical niceties—involved in the preparation of medicines than any other body of men in the country. And I would even go so far as to affirm that they are better acquainted with the science of the subject, as far, at any rate, as the practical application of science to pharmacy is concerned. Again, we claim the position of being officially recognised in the production of a National Pharmacopœia, and most strongly insist upon this as a right, upon the ground that the National Pharmacopœia is a work of legal authority; that we are bound by its provisions, and are liable to suffer pains and penalties unless we follow the details given as to

quality, practice and purity of the drugs, preparations, and chemicals. We have a right to be officially consulted upon these matters of detail, so as, if possible, to avoid the introduction of vexatious or impossible formulæ or conditions. We claim further that we ought to have a voice in framing the laws under which we are to be judged; for let it not be forgotten that the Pharmacopœia is in effect a code of law, which must be obeyed, even if wrong or unreasonable, or the pharmacist must expect to lose both in pocket and reputation.

I have said that the non-recognition of our claim to the position to which we consider we are entitled in this matter has appeared to me unaccountable. I fear I must withdraw that expression, or at any rate attempt to account for the unaccountable. I have had many opportunities of speaking upon this subject to influential men of various positions, both in the medical and the general world, and the general expression of opinion has been one of surprise that pharmacists are not already entrusted with a share in the production of the Pharmacopœia. Among the many members of the medical profession to whom I have spoken, I have not found one who professed to see any reason why we should not be entrusted with our proper share of the work, whilst many have expressed a strong opinion that we ought to take an active part in it. As for members of the general public, they are simply bewildered if they think upon the matter at all; but as far as my experience has gone, all, without exception, have been favourable to the claim we make. Still it is noteworthy that we do not get what we ask, and it is pretty evident to my mind, at least, that notwithstanding all that has been done to move the Government in our favour, some greater influence has succeeded in neutralizing our endeavours to obtain the assistance of the Government in establishing by law our reasonable claims, and I am forced to the conclusion that it is an unwillingness in certain quarters to recognise pharmacists, even in a *quasi*-professional sense, that lies at the root of this matter. We are tradesmen, and it appears that therefore, notwithstanding any amount of education, training, or examination to which we may submit, we are not to receive the recognition which is strictly and justly our due. If this is indeed the explanation of the matter, I can only say it increases my wonder. In no other country does the keeping of an open shop prevent a pharmacist from taking his proper place, side by side with the medical practitioner, and in fact becoming his essential adjunct. In most countries, indeed, the pharmacist (or apothecary) is the only legally recognised dispenser of medicine, the practice of

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pharmacy being jealously restricted to those who have made a special study of the subject, and not permitted to be exercised by those only possessing the very general knowledge acquired by students who have to devote the greatest amount of their time to other and more special branches of medical knowledge.

I cannot conclude without alluding to the subject of an International Pharmacopoeia. More than once in years gone by this subject has been brought forward at the meetings of the International Pharmaceutical Congress, and especially on the occasion when we had the honour and great pleasure of receiving the Congress in London. It is also announced that the subject will again form a principal topic of discussion at the forthcoming meeting of the Congress in Brussels.

At the Congress in London all were agreed that a great necessity existed for the creation or compilation of such a work; but it must be admitted that very little progress appears yet to have been made towards settling the very important question as to its extent and scope. I am aware that an influential Committee was appointed to take these matters into consideration, and to report to the next meeting of the Congress. We shall all, I am sure, wait with great interest the result at which this Committee may arrive, and hope that a solution will be found of some of the important, and not easily reconcilable, questions which are involved in the attempt. I trust, however, the Committee will bear in mind that by attempting too much at once it will court failure, whilst by limiting the number and nature of the articles proposed to be included in the work to a few special articles, a much greater chance of a general acceptance of the scheme will be secured. We might then hope to see, even in our time, a general agreement arrived at between all nations as to the strength standards of such articles as opium preparations, hydrocyanic acid, and such compounds, which are of universal use in medicine, and the uniformity in the strength of which, as a protection to the general safety of the public, needs no argument. Years ago this necessity was not nearly so real; but in these days, when the public generally travel so continuously, and to such various distant countries, uniformity is not only desirable, but absolutely necessary, if we would escape the certainty of distressing accidents continually occurring. Although, therefore, the question of the settlement of an international pharmacopoeia in a spirit of wisdom and sound sense is, to us in England, second in importance to that of our own national work, it still must possess the highest interest for all who look upon pharmacy as a profession instituted

not entirely for the benefit of those who practise it, but also for the good of the community.

Mr. F. ROSSITER (Hastings) moved a hearty vote of thanks to the President for the admirable and instructive address he had delivered. Mr. Williams's great reputation as an accomplished pharmacist, and his great knowledge of scientific preparations, had led all to look forward with more than ordinary interest to this address, an expectation which had not been disappointed. From the beginning to the end they must all have been interested in the very highest degree, not only with reference to the numerous preparations which had been mentioned, but even more so perhaps in that part which referred to their relation to the medical profession, which might easily give rise to a very interesting discussion. He would not attempt, however, to enter upon any such discussion, which might probably run to much greater length than there was time for, seeing the number of papers which appeared on the programme.

Mr. A. I. JOSEPH (St. Leonards) seconded the motion, which was carried unanimously, and briefly acknowledged by the President.

The reading of papers was then proceeded with, the first two being—

A REPORT ON ENGLISH RHUBARB.

By WILLIAM ELBORNE,

Assistant Lecturer on Materia Medica and Pharmacy, Owens College.

In a paper* read before the School of Pharmacy Students' Association, with a view of classification, I divided the numerous varieties of commercial rhubarbs into two groups, viz. :—

Asiatic Rhubarbs.

Chinese	Russian, Muscovy,	yielded by	{	<i>Rheum palmatum</i> var. <i>Tanguticum</i> and <i>Rheum officinale</i> ?
	or Turkey.			
	Canton or East Indian.			
	Batavian or Dutch trimmed.			
Siberian	. . . . .	„		<i>R. rhaponticum.</i>
Himalayan (large)	. . . . .	„		<i>R. Emodi.</i>
„ (small)	. . . . .	„		<i>R. Webbianum.</i>
Bucharian	. . . . .	„		<i>R. undulatum.</i>

* *Pharm. Journ.* [3], xiii. 1046.

European.

English	. . . . .	„	{ <i>R. rhaponticum</i> . <i>R. officinale</i> .
French	. . . . .	„	{ <i>R. rhaponticum</i> . <i>R. compactum</i> . <i>R. undulatum</i> .
Austrian (Moravian)	. . . . .	„	<i>R. rhaponticum</i> .

As well known, the bulk of rhubarb imported into this country is of Chinese origin, and reputed to be afforded by the two species, *Rheum officinale* and *R. palmatum* var. *Tanguticum*.

The cultivation of rhubarb in this country for the sake of the root, dates back to the year 1608; and up to 1876, English-grown rhubarb appears to have been the produce of *R. rhaponticum* and probably of *R. undulatum*. At the present day, however, in addition to these varieties, we have a further supply afforded by *R. officinale*, derived from the plant introduced into this country in 1867 by the late Daniel Hanbury, as a source of the true Asiatic rhubarb.

The object of this and my succeeding paper will be to discuss the nature and value of this drug as compared with its congener *R. rhaponticum* and Asiatic rhubarb as at present imported.

Rheum officinale,* Baillon.

Of the English-grown drug there are two varieties, known as the "ordinary cultivated" and the "highly cultivated" root.

Botanical Description.—*R. officinale* is a perennial noble plant, resembling *R. rhaponticum* and *R. undulatum*, but of larger size. It differs from these latter species (which yield the common garden rhubarb) in the following particulars:—The leaves spring from a distinct crown, rising several inches above the surface of the ground, and have sub-cylindrical petioles, which, as well as the veins of the under surface of the lamina, are covered with a pubescence of short erect hairs. The lamina, the outline of which is orbicular, cordate at the base, is shortly five to seven lobed, with the lobes coarsely and irregularly dentate; it attains 4 to 4½ feet in length, and rather more in breadth. The best distinguishing character of *R. officinale* is the strong development of the sympodium or rootstock, a large portion of which projects conically above the ground, being provided with a few lateral roots about the thickness of the finger. Also the first epidermis of the radical portion is remarkable for the bright brownish red colour, the roots of the other species being yellowish brown.

* Figured *Bot Mag.*, 1874, t. 6135.

*History.**—For authentic specimens of this plant, known to be a source of the Asiatic drug, we are indebted to French missionaries, who, commissioned by M. Dabry, French Consul at Hankow, in 1867, obtained leaves and cuttings from the south-eastern part of Thibet. These specimens were transmitted to Dr. Soubeiran, and grown in the garden of the School of Pharmacy at Paris, and subsequently described by Baillon.† From this source offsets of the root came into the possession of Hanbury and Flückiger, who, in 1872, paid a visit to the rhubarb fields of Mr. Rufus Usher, at Bodicote, in Oxfordshire. In correspondence with Mr. Usher, he writes: "In the spring of the following year, at the request of Professor Flückiger, Mr. Hanbury very kindly sent me an offset from a root in his possession, from which he had succeeded in growing a very fine root in time to produce a dried specimen for the Philadelphia Exhibition in 1876. By the exhibition of this specimen, Mr. Usher was awarded a medal 'for success in cultivating rhubarb for medicinal purposes, and creating a quality that compared favourably with the best roots.'" Professor Flückiger has also expressed the opinion that the root of *R. officinale* grown at Bodicote, agrees in every way with the Chinese drug except in the somewhat finer colour of the latter.

Cultivation.—It is a fact, I believe well established, that by cultivation, the roots of certain medicinal plants, such as aconite and valerian, lose much of their medicinal activity, due probably to the extra development of inert tissues at the expense of others. About twelve months ago, having occasion to examine a sample of "highly-cultivated" English-grown *R. officinale*, from the excessive development of the white parenchymatous tissue the fracture displayed, I expressed this view to Mr. Usher as applying to the sample in question. In reply, Mr. Usher fully endorsed the opinion, remarking that he invariably found that the slower the growth and the longer the time the roots were allowed to mature, the more condensed they became and yielded richer and darker tints in the prepared root. In explanation he also further stated that being very desirous of raising and multiplying as rapidly as possible the small plant presented to him by Flückiger and Hanbury, he resorted by the application of stimulants to a very highly-forced cultivation. Having succeeded in raising a large number of plants, Mr. Usher, aware of the defects of this mode of cultivation, established another plantation of *R. officinale*, grown on a more natural system, known

* *Pharm. Journ.* [3], vi. 861.

† *Ibid.*, [3], iii. 801.

as "ordinary cultivation." The former practice not having been abandoned, for want of experimental evidence as to the respective pharmaceutical value of the two products, we consequently meet in the market with two different forms of the same drug.

English-grown rhubarb plants are propagated from the offsets or lateral shoots of four-year old plants, set at distances of from six to eight feet apart, and left to grow for from five to seven years, when the roots are ready for collection.

By "ordinary cultivation" is understood the method of planting the young offsets on an average soil, two years after the last manuring. "High cultivation" consists in growing the plants on the richest soil possible, with copious dressings of liquid and solid manure. The cultivation of *R. rhaponticum* comes under the ordinary method. At Bodicote about forty acres are under cultivation.

Collection.—The roots are dug up in the dry weather between July and September, and having been peeled and sliced into pieces known in the trade as "flats" and "rounds," the rootlets furnishing "small rounds" or "sticks," they are first exposed to a current of air in an open bedding for several days, and the drying completed by means of artificial heat at 90° F. This mode applies to all varieties of English rhubarb. In the last stages of drying, *R. officinale* will not bear so high a temperature as *R. rhaponticum* by ten degrees.

Description.—Both varieties of *R. officinale* occur in flat concavo-convex pieces, weighing from three to four ounces each. The outer convex surface displays a number of deep, longitudinal furrows, the effect of drying, and is traversed throughout with a longitudinal ramification of conspicuous veins, producing altogether a different appearance to the fine net-veined markings displayed by some samples of the present commercial East Indian rhubarb. In the centre of the concave surface of each piece a small hole has been drilled half-way through for the purpose of ascertaining the soundness of the pieces internally, and in this feature it corresponds with the now extinct Russian rhubarb. The pieces show the same stellate markings as the East Indian, especially on the inner surface, much more in some than in others. While the "ordinary" and "highly cultivated" bear a great resemblance to each other externally, the fracture of the former shows a more compact structure, and the internal veins a deeper colour; the odour is stronger, and the colour of the powdered root is much darker coloured than the highly cultivated. Neither varieties present the red appearance displayed by the fracture of *R. rhaponticum* or the imported drug, nor do they

yield the same bright yellow powder of the latter. They are distinctly gritty when chewed. On fracture the comparatively black colour of the veins imbedded in a whitish parenchymatous tissue readily distinguishes the cultivated varieties of *R. officinale* from *R. rhaponticum*.

Microscopical Structure.—For the following description I am indebted to my friend Mr. W. Kirkby, who has been kind enough to prepare and examine a number of sections for the purpose:—"The outer layer immediately beneath the epidermal portion consists of about eight rows of tabular parenchyma extended tangentially. Within this is a broad zone of loose parenchyma containing starch, into which the medullary rays extend about half way across. Next comes the dark cambial line made up of several rows of closely compacted oblong parenchyma exhibiting the radial arrangement of the medullary rays. Between the medullary rays are seen groups of large reticulated vessels, consisting of from one to five vessels, arranged for the most part in a radial manner. They are surrounded by unthickened elongated parenchyma. The colouring matters are found in the medullary rays. The centre of the root shows no definite arrangement of the tissues, being a mass of parenchymatous cells interspersed irregularly by the medullary rays. The whole root is loaded with starch. The granules are generally compound. The larger single granules have a diameter of about 20 micromillimetres. The hilum is generally, but only slightly, eccentric, and is seen as a small black dot. When mounted in Canada balsam, the black cross is distinctly visible with polarized light. Raphides are fairly numerous, and vary considerably in size. In the loose tissue of the root, just within the zone of radial medullary rays, are found scattered the stars so characteristic of Chinese rhubarb; these exhibit all the anatomical features of the root. *R. officinale* differs chiefly from Chinese rhubarb in that it contains more starch, and from *R. rhaponticum* in the vessels and cells of the medullary rays being larger, and the arrangement of the various tissues being less distinct and regular."

Chemical Composition.—The active properties of rhubarb are considered to be chiefly due to cathartic acid, chrysophan, tannin, and the resinous substances, emodin, erythroretin, and phæoretin. The following are the results arrived at in my examination of English rhubarb in reference to these constituents:—

	R. officinale ord. cult. per cent.	R. officinale highly cult. per cent.	R. rha- pon- ticum. per cent.	East Indian Rhubarb. per cent.
Cathartic Acid	3.5	3.2	3.3	4.5
Chrysophan and Tannin . .	14.3	11.7	12.5	11.7
Resinous substances . . .	2.6	2.0	3.4	4.6
Mucilage	6.5	4.8	4.1	4.0

From the above it will be seen that the composition of English cultivated rhubarbs compares favourably with that of the Asiatic drug, and that the ordinary cultivated *R. officinale* is superior to the highly cultivated variety.

Commerce.—The total production of English rhubarb may be estimated at 12,000 pounds annually, from 3000 to 4000 pounds of this quantity being exported. Messrs. Rufus Usher & Sons, to whom I am indebted for much valuable information in the compilation of this paper, are at present the sole producers.

In conclusion, while English rhubarbs apparently yield very good tinctures, a report from the medical profession on their therapeutic qualities can alone determine their legitimate use in pharmacy.

ANALYSES OF RHUBARB.

BY WILLIAM ELBOENE,

Assistant-Lecturer on Materia Medica and Pharmacy, Owens College.

The following analyses have been undertaken with the view of ascertaining the composition and relative value of English-grown rhubarbs. So far as time has permitted me to pursue the subject, I have followed the method of analysis adopted by Professor Dragendorff* and Mr. H. G. Greenish.†

The following samples were taken :—

1. *Rheum officinale*.—Flats, English-grown rhubarb, "ordinary cultivation" (five years' growth). From Mr. Rufus Usher.

2. *Rheum officinale*.—Flats, English-grown rhubarb, "highly cultivated" (six years' growth). Mr. Rufus Usher.

3. *Rheum rha-pon-ticum*.—Flats, English-grown rhubarb, a good commercial specimen.

4. *East Indian Rhubarb*.—Flats, a fine specimen, displaying the net-veined markings. From the Materia Medica [Museum, Owens College.

5. *Russian Rhubarb*.—An old authentic specimen, displaying the

* *Pharm. Journ.* [3], viii. 826.

† *Ibid.* [3], ix. 933.

net-veined markings. From the *Materia Medica* Museum, Owens College.

The quantity of root necessary for analysis was well powdered and passed through a fine sieve containing forty-four meshes to the linear inch.

1. *Estimation of Moisture*.—Upon drying at a temperature of 110° C., the loss of moisture was as follows:—

No. 1.	0.857 gram lost	0.052 = 6.06 per cent.
„ 2.	1.01 „	0.08 = 7.9 „
„ 3.	1.073 „	0.06 = 5.57 „
„ 4.	1.185 „	0.065 = 5.4 „
„ 5.	1.205 „	0.152 = 12.6 „

2. *Estimation of Ash*.—The residue from the above estimation incinerated in a platinum dish yielded the following grey ash:—

No. 1.	0.08 gram = 9.33 per cent.
„ 2.	0.05 „ = 4.9 „
„ 3.	0.85 „ = 7.9 „
„ 4.	0.11 „ = 9.28 „
„ 5.	0.08 „ = 6.63 „

3. *Aqueous Extract*.—Five grams of the powdered root was macerated forty-eight hours with so much distilled water that the mixture measured 100 c.c., frequently shaken, and finally allowed to stand. The volume of the root-sediment then occupied:—

No. 1.	45 c.c.
„ 2.	37 c.c.
„ 3.	85 c.c.
„ 4.	45 c.c.
„ 5.	50 c.c.

The respective supernatant liquids, exhibiting marked differences in colour (Nos. 1 and 5 being more the colour of port wine, as compared with Nos. 2, 3, 4, which were sherry coloured), upon filtration yielded between 50 and 60 c.c., of aqueous extract, which was used in experiments described in paragraphs 4 to 8. The marc in the cylinder was then washed out with sufficient water to bring the product up to 100 c.c., and the wash water filtered through the same filter. The solid residue was then thrown upon a piece of fine muslin placed within the filter, allowed to drain, and the whole finally dried at 30° C. This was used in Experiment 9.

4. *Combustible Substances Soluble in Water*.—Upon evaporating to dryness 5 c.c. of the aqueous extract (25 gram root) in a tared platinum dish, weighing, incinerating, and again weighing, the following numbers represent the combustible matter present:—

No. 1. . .	0.085 less 0.007 ash	= 31.2 per cent.
„ 2. . .	0.085 „ 0.004 „	= 32.4 „
„ 3. . .	0.076 „ 0.005 „	= 28.4 „
„ 4. . .	0.07 „ 0.005 „	= 26.0 „
„ 5. . .	0.095 „ 0.006 „	= 35.6 „

5. *Mucilaginous Matter*.—Twenty c.c. of the aqueous extract (1 gram of the powder) was mixed with 60 c.c. of 95 per cent. alcohol, allowed to stand for forty-eight hours, and the precipitate collected on a tared filter, washed with alcohol, dried and weighed.

No. 1 yielded . . .	0.065 = 6.5 per cent.
„ 2 „ . . .	0.048 = 4.8 „
„ 3 „ . . .	0.041 = 4.1 „
„ 4 „ . . .	0.040 = 4.0 „
„ 5 „ . . .	0.055 = 5.5 „

6. *Cathartic Acid*.—The filtrate and alcoholic washings from No. 5. were rapidly evaporated on a water-bath until the residue measured 5 c.c. This was mixed with 40 c.c. of absolute alcohol, the precipitated cathartic acid collected on a tared filter, washed with alcohol, dried and weighed.

No. 1 yielded .035 gram precipitate	= 3.5 per cent.
„ 2 „ .032 „ „	= 3.2 „
„ 3 „ .033 „ „	= 3.3 „
„ 4 „ .045 „ „	= 4.5 „
„ 5 „ .032 „ „	= 3.2 „

7. *Tannin and Chrysophan*.—To another 20 c.c. of the aqueous extract solution of acetate of copper was added in slight excess; the brown precipitate was collected on a tared filter, rapidly washed with a small [quantity of water, dried and weighed. The precipitate was then ignited with ammonium nitrate, and the amount of cupric oxide residue deducted; the difference represented tannin and chrysophan.

No. 1 yielded 0.15 gram ppt. less 0.007 CuO	= 14.3 p. c.
„ 2 „ 0.14 „ „ „ 0.023 „	= 11.7 „
„ 3 „ 0.145 „ „ „ 0.02 „	= 12.5 „
„ 4 „ 0.12 „ „ „ 0.013 „	= 11.7 „
„ 5 „ 0.12 „ „ „ 0.02 „	= 11.0 „

8. *Organic Acids*.—The filtrate from Experiment 7 was precipitated with neutral acetate of lead, the precipitate collected, washed, dried, and weighed, incinerated, and again weighed.

No. 1. . .	0.055 less 0.022 PbO	= 3.3 per cent.
„ 2. . .	0.037 „ 0.005 „	= 2.2 „
„ 3. . .	0.03 „ 0.015 „	= 1.5 „
„ 4. . .	0.047 „ 0.017 „	= 3.0 „
„ 5. . .	0.065 „ 0.02 „	= 4.5 „

9. *Resinous Substances Soluble in Alcohol*.—The residue of the root after extraction with water was digested in absolute alcohol for six days, filtered through the filter used in Experiment 3, and the residue washed with absolute alcohol. The filtrate and washings; evaporated to dryness and weighed, yielded the following amounts of residue (emodin, erythroretin, phæoretin, and other resinous substances).

No. 1.	. . . . .	0.13 gram = 2.6 per cent.
„ 2.	. . . . .	0.1 „ = 2.0 „
„ 3.	. . . . .	0.17 „ = 3.4 „
„ 4.	. . . . .	0.23 „ = 4.6 „
„ 5.	. . . . .	0.26 „ = 5.2 „

10. One gram of the rhubarb was macerated in 30 c.c. of petroleum ether for six days. It was then filtered, evaporated to dryness, and weighed. Each sample left a residue which, examined under the microscope, consisted of flat rhombic crystals and fat, which gave the purple colour on addition of caustic soda [chrysophanic acid?].

No. 1.	. . . . .	.004 = 0.4 per cent.
„ 2.	. . . . .	.008 = 0.3 „
„ 3.	. . . . .	.002 = 0.2 „
„ 4.	. . . . .	.007 = 0.7 „
„ 5.	. . . . .	.015 = 1.5 „

11. Two grams of rhubarb extracted with absolute alcohol yielded the following extract:—

No. 1.	. . . . .	0.43 = 21.5 per cent.
„ 2.	. . . . .	0.28 = 14.0 „
„ 3.	. . . . .	0.39 = 19.5 „
„ 4.	. . . . .	0.49 = 24.5 „
„ 5.	. . . . .	0.485 = 24.25 „

	R. officinale, ordinary cultivation.	R. officinale, high cultivation.	R. rhaponticum.	East Indian Rhubarb.	Russian Rhubarb.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Moisture	6.06	7.9	5.57	5.4	12.6
Ash	9.33	4.9	7.9	9.28	6.63
Mucilage (soluble in water)	6.5	4.8	4.1	4.0	5.5
Cathartic Acid	3.5	3.2	3.3	4.5	3.2
Tannin and Chrysophan	14.3	11.7	12.5	11.7	11.0
Organic Acids	3.3	2.2	1.5	3.0	4.5
Resinous substances soluble in Alcohol	2.6	2.0	3.4	4.6	5.2
Fat and Free Chrysophanic Acid soluble in Petroleum Ether	0.4	0.3	0.2	0.7	1.5

A vote of thanks was passed to Mr. Elborne for the papers.

Mr. HOLMES said these papers must have cost Mr. Elborne a great deal of labour, and there were one or two points on which he should like to have a little further information. When he visited Banbury some years since, Mr. Usher was only just thinking of introducing *Rheum officinale* root into commerce, but it appeared that it was now being sent into the market in two different forms, one grown under ordinary conditions, and the other more highly cultivated, which was said not to be so valuable. It became important, therefore, to learn if these two could be readily distinguished. It seemed that the fresh *Rheum officinale* root could be distinguished from the *rhaponticum* root by the dark red veins; and he should be glad to know if the veins remained equally dark in the dried root. It was pretty well known that no Russian rhubarb had been imported since 1860, and therefore the specimen Mr. Elborne had examined was of some interest. It had been presented to him (Mr. Holmes) some years ago by Dr. Leared, and as there were good specimens in the museum in Bloomsbury Square, and none in that at Owens College, he sent it there. The extra amount of moisture discovered in it was probably owing to Dr. Leared having kept it for some years in a drawer which was not very dry, and where it would probably absorb moisture. With regard to the deductions drawn from the analyses, he thought, although Mr. Elborne had done a great deal of very valuable work, that the conclusions could hardly be yet considered as decisive, owing to the remarkable differences which were known to exist in different samples of the same variety, some being very light and spongy, whilst others were hard and resinous, the latter being commonly used for cutting up into the so-called Russian rhubarb. These samples would probably differ in the quantity of extractive matter, and, therefore, a great number of specimens should be examined to get a fair average.

Mr. PLOWMAN reminded the Conference that the grant was originally made for the purpose of determining the comparative value of commercial rhubarbs, to which the titles of these papers did not exactly correspond. A great number of valuable facts had been submitted, but as the grant was made in order to determine the comparative value of commercial rhubarbs, he should like to ask Mr. Elborne if he had deduced any conclusions from the facts he had ascertained, as to which kind of rhubarb would be best for medicinal purposes, and which had the most therapeutical value. He hardly supposed that Mr. Elborne would be able to draw such deductions, but he might have formed some opinion.

Mr. MARTINDALE asked if Mr. Elborne considered the cathartic acid in rhubarb, which he regarded as the main medicinal agent, as being identical with the cathartic acid in senna. He looked upon chrysophan as being an important constituent in the medicinal activity of rhubarb, and was surprised that Mr. Elborne had not determined its quantity. He thought that benzol would be a better solvent than petroleum ether for extracting this substance from either goa powder or rhubarb, better even than dealing with the residue of an aqueous extraction. Tannin also, was, no doubt, an important constituent. Rhubarb was a very complex body therapeutically, and it was by no means understood which constituent was of chief importance. It was still largely used, though not so much so as it was twenty years ago.

Mr. BORLAND thought one point mentioned by Mr. Elborne was worthy of a little further explanation. He stated that a difference of 10° F. in the application of artificial heat made a great difference on the two varieties, and he should like to know what were the exact effects produced by so small an increment of temperature.

Mr. GREENISH suggested that as Mr. Elborne did not take that which was considered by Professor Dragendorff as the active principle, he should make aqueous extracts from each of these varieties, and let their therapeutic value be determined, to ascertain whether the results correspond with those he arrived at, from a chemical point of view.

Mr. DOTT asked whether the chrysophan of rhubarb was identical with the chrysarobin of goa powder.

Mr. SCHACHT hoped Mr. Elborne would answer all the questions on the physics, chemistry, or cultivation of rhubarb, but that he would not attempt to deal with the therapeutical side of the question. There was a certain class of investigations which legitimately belonged to them, and there was another class which they were not competent to perform properly.

Mr. ELBORNE in reply to Mr. Schacht's remarks, drew attention to a passage at the conclusion of his paper, in which he referred to the necessity of the therapeutical activity of these different rhubarbs being determined by medical authorities.

Mr. ELBORNE said it was his privilege to live amongst a number of eminent medical men, and he had no doubt he should be able to prevail upon some of them to take up this subject. They were already investigating the action of some drugs in the Manchester Infirmary, and he had prepared tinctures of all these rhubarbs, which he believed Dr. Leech was going to experiment with. In

reply to Mr. Holmes, he might say that the distinction between the *R. officinale* and *R. rhaponticum* was quite obvious. The fracture of *R. officinale*, whether highly cultivated or not, was quite different from that of *R. rhaponticum*, the former being comparatively black while the latter was red. He could illustrate that by the fresh specimens on the table; and the difference was quite as obvious in the dried drug. The difference between the two varieties of *R. officinale* was not so obvious, but it only required a careful fracture to be made of these two rhubarbs, when it would be found that the highly cultivated was much more spongy and had more white parenchymatous tissue than the ordinary kind, which took longer to grow. He should be pleased to forward any gentleman who was interested in the matter specimens of each of these varieties. He was certainly surprised to find so much moisture in the Russian root, and no doubt it was accounted for as Mr. Holmes had suggested. He had originally intended to make complete analyses of each variety, but time did not admit of this, and therefore he thought he had better determine somewhat roughly the more important constituents as they were considered. For that purpose he treated them each in a similar way, by the method followed by Dragendorff and Greenish. All he did was to treat them with certain solvents; he had not time to separate the chrysophan from the tannin. In reply to Mr. Martindale, he should say that the cathartic acid in rhubarb was identical with that found in senna. He would add that each precipitate exhibited a somewhat albuminous appearance, but each slightly differing from the others. Rhubarb did not contain much chrysophanic acid in the free state, but chrysophan, which was no doubt closely allied to it. With regard to the extraction of this body, he thought petroleum ether preferable to benzol, because it had a much lower boiling point. With regard to the difference of temperature, he might say that the drying of rhubarb was a very difficult matter, and it was found that the *R. officinale* more readily became rotten if subjected to the same temperature as the *R. rhaponticum* could stand very well. If overheated it seem to undergo disintegration of tissue, and so decomposition took place. The drying was carried on at a temperature of about 95° F. He could not answer Mr. Dott's question whether chrysophan was identical with chrysarobin.

The PRESIDENT said this question of drying rhubarb reminded him of a new process which had been lately adopted for drying gunpowder by means of anhydrous chloride of calcium. It was dried much more efficiently and safely in this way, and it struck

him that rhubarb might be dried in the same way; the only thing required was to see that the chloride of calcium was perfectly dry; it was very cheap, being a mere refuse product.

Mr. ELBOENE added that the process of drying was very difficult, the temperature he had mentioned having to be maintained for about six weeks. He had suggested to Mr. Usher that if cut in slices, as was done with other succulent roots, the process would be much facilitated, and it could not affect the pharmaceutical value of the article, but it would not of course have the elegant appearance which the ordinary pieces of root had.

The next paper read was a—

FINAL REPORT ON THE ALKALOIDAL VALUE OF CULTIVATED AND WILD BELLADONNA PLANTS.

By A. W. GERRARD, F.C.S.

This communication is a continuation of work concerning which two previous reports have been made. In the first of these it was shown that the wild belladonna contained more alkaloid than the cultivated, also that the alkaloid was generally more abundant in the leaves than in the roots. In the second report it was pointed out that belladonna attains its most active or highest state of development, as regards alkaloid, at the period of flowering.

The preceding results having been arrived at by a limited number of analyses, it was considered desirable they should receive further confirmation; likewise that the second, third, and fourth years' growth of belladonna should be submitted to analysis, the object being to ascertain if any notable differences would be found in the alkaloidal yield of the plants at these various ages.

Through the kindness of several friends I have been able to obtain an ample supply of cultivated belladonna; in addition, I have grown some plants in my garden in London from roots sent me by Mr. Ransom, of Hitchin. In obtaining a proper supply of wild belladonna I experienced some difficulties; excepting a few sent me from Yorkshire, the plants were of my own collecting, and gathered in Sussex, Surrey, and Warwickshire. No special month can be fixed for collecting the plants, as this should be done at the period of flowering, which has been shown to be the time of highest activity. The flowering of the plants varies with the seasons, sometimes commencing in May and passing into July. In all cases the plants selected for examination were average flowering specimens, of fairly uniform growth.

The method of conducting the examination of the plants has been as follows:—The leaves and roots were carefully separated from the stems, dried at 100° to 105° F., then separately reduced to fine powder. For each analysis 50 grams of the powder was taken; a parallel experiment being conducted as a check in each case. Exhaustion of the powder was completed with alcohol, the alcoholic extract dissolved in water and filtered from the insoluble resinous matters; the aqueous portion now treated with ammonia in excess was well shaken with ether. Upon separation of the ether it was allowed to rest a few minutes, that excess of ammonia might escape, then shaken with dilute acetic acid, when an aqueous substratum of acetate of the alkaloids separated; this was treated a second time with ammonia and ether; finally the ether gave on spontaneous evaporation the alkaloid in the form of a pale-brown or yellow crystalline mass.

The quantity of alkaloid in the residue was determined by the process described to this Conference two years ago, that being to exactly neutralize the residue with sulphuric acid standardized, so that 100 c.c. equals or makes neutral 1 gram of pure atropine.

To test the accuracy of the foregoing process, I worked out gravimetrically a titrated solution of the sulphates of the alkaloids equivalent to 1 gram of atropine, and after two separations by ammonia and ether, obtained, when dried at 100° F., .961 gram of nearly white crystals of alkaloid. This shows a loss of 3.9 per cent., which may be attributed to the mechanical steps of the process. This method of analysis has given me the highest satisfaction; it is easily conducted, and I believe, very accurate.

Percentages from Alkaloid from Wild Belladonna.

Age of Plant.	Yield from Root.	Yield from Leaf.
2 years.	.260 per cent.	.431 per cent.
3 "	.381 "	.407 "
4 "	.410 "	.510 "

Percentages of Alkaloid from Cultivated Belladonna.

Age of Plant.	Yield from Root.	Yield from Leaf.
2 years.	.207 per cent.	.320 per cent.
3 "	.370 "	.457 "
4 "	.813 "	.491 "

The above tables represent twenty-four analyses, two having been carried out in each case; the percentages given are the average. Besides these, I have made fifteen other analyses, or thirty-nine in all, a number I believe sufficient to furnish the information sought. If the sum of the percentages be divided by the number of analyses, the answer will show the average alkaloidal yield of root and leaf on the whole number of analyses conducted in each case; thus the leaf of the wild plant gave '449, the cultivated '422 per cent.; the root of the wild gave '350, and the cultivated '296 per cent. It is evident from this result that the wild plant is the most powerful.

I referred to some plants I had grown in London. I have recently examined the leaves of these plants. The result shows they have not deteriorated in quality by their transference; for whilst the leaves of a plant when received fresh from the country gave '433 per cent. of alkaloid, the leaves of the same plant grown in London yielded '442 of alkaloid, showing a small increase. The leaves of the London-grown plants were not so finely developed as those of the country. They were pale in colour, and generally the plants were weaker; but it is of some importance to know that no falling off had taken place in the most useful constituent of the plant by transference to a new soil and atmosphere.

Whilst collecting wild belladonna, I had noticed that many plants were produced from shoots, sometimes thrown out as runners from the crown of a root, or developed from an exposed part of a root. On this point Mr. Holland, of Market Deeping, informs me:—"The plants from suckers you refer to are much more prone to rot than the plants grown from seed." It is thus evident from this practical experience of a grower that the plant could not be successfully cultivated by division of the roots. Amongst the wild belladonna I have observed the recumbent variety first noticed by Mr. Holmes; an analysis showed it to contain the average quantity of alkaloid.

After a consideration of the results and bearings of the above experiments, I have drawn the following conclusions:—

1. Wild belladonna generally contains more alkaloid than the cultivated, but the difference is not so wide as to make it of any material consequence which variety is employed for the manufacture of pharmaceutical preparations. But for uniformity, I suggest that they be made with the cultivated plant, the wild being retained for the preparation of atropine.

2. With reference to the part of the plant richest in alkaloid, the leaf has been found to yield it most abundantly, the root, fruit

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and stem being the next in order. It would seem from this observation that preparations of belladonna leaf should supersede those of the root. But if we consider the great strength of liniment of belladonna, the only official galenical preparation made from the root, its comparative cleanliness, and the general satisfaction it gives to the medical profession, there is no good reason to advocate a change.

The expediency of introducing an alcoholic extract of belladonna leaves into the British Pharmacopœia will, I believe, be generally acknowledged; such an extract is a necessity in most dispensing establishments where belladonna suppositories have to be made; and it certainly would supersede with advantage, in belladonna plaster, the extract made by the sadly unskilful process now official. Again, such an extract is well suited for making belladonna ointment. In the present formula there is no harmony or compatibility of ingredients; we have a mechanical mixture of extract, water, and fat, soon passing into a state of mouldiness. On the other hand, were it made with an alcoholic extract, it would be a perfectly homogeneous ointment of a most permanent character.

3. It has been shown in a previous communication that belladonna of the first year's growth is a small plant, not worth collecting, containing but little alkaloid; from the second to the fourth year of its age, the plant shows a slight increase in strength. It is therefore evident that from two to four years of age, and at the period of flowering, the plant is in the best condition for use.

4. The roots of belladonna may be collected at the same time as the leaves; a series of experiments having demonstrated that roots collected in May, July, and September, contained fairly uniform quantities of alkaloid. From this we may assume that the growth of the leaf does not exhaust the root or remove from it any active principle, but rather that there is a simultaneous development of both parts.

I have not attempted in this communication to enter into a discussion as to the causes which may accelerate or retard the development of the active principles of belladonna, for such a discussion could scarcely lead to any very useful practical results, the study of such questions requiring not only the possession of a drug farm, but a vast amount of patience and devotion, combined with a lengthened period of observation, such as few pharmacists, however devoted they may be, would care to undertake.

I beg to thank most heartily the British Pharmaceutical Conference for its generosity in assisting by a grant the expenses

incurred during this investigation, as likewise those friends who have sent me belladonna plants.

A vote of thanks having been passed to Mr. Gerrard for his paper, the President suggested the two following papers should be read before beginning the discussion :—

REPORT UPON THE ESTIMATION OF THE ALKALOIDS IN *ATROPA BELLADONNA*.

BY WYNDHAM R. DUNSTAN, F.C.S., AND FRANCIS RANSOM.

In a paper communicated to the Pharmaceutical Society (*Pharm. Journ.* [3], xiv. 623), we have shown that the salts of atropine and hyoscyamine which exist in the root of *Atropa Belladonna* can be very readily extracted therefrom by hot percolation with a mixture of chloroform and an equal volume of absolute alcohol. Chloroform alone was found to be an inefficient solvent, and alcohol alone to extract non-alkaloidal substances that are not extracted when chloroform is present. When the chloroform-alcohol percolate is agitated with water, the whole of the alkaloidal salts are withdrawn, while nearly all the colouring matter remains dissolved in the chloroform. When ammonia is added to the aqueous solution and the liquid agitated with chloroform, the alkaloid is extracted and the small amount of colouring matter remains in the ammoniacal liquid. The purity of the atropine and hyoscyamine obtained by evaporating the chloroform was proved by converting the alkaloids into the periodides and by decomposing with sodium thiosulphate, when the regenerated alkaloid was found to coincide in weight with the residue originally operated upon. The special features that distinguish this process are: (1) It is simple and accurate; (2) a high temperature is avoided; (3) the solvent employed extracts a minimum of non-alkaloidal constituents; (4) no precipitants as such are used; (5) the use of acids is avoided; (6) the alkaloids are not heated with alkalis.

Since the publication of these results we have been engaged in experiments upon the estimation of the alkaloids in the leaves of *Atropa Belladonna*, in the carrying out of which we have encountered many difficulties. Many of these have since been overcome, and we hope early next year to be able to propose a simple method for estimating the atropine and hyoscyamine in the leaves.

A FEW NOTES ON THE GROWTH OF BELLADONNA
AND HYOSCYAMUS.

BY T. J. HASSELBY.

The various papers read before this Association on belladonna by Mr. Gerrard, the one by Dr. Attfield advocating the culture of medicinal plants, coupled with the high price of hyoscyamus leaves, led the writer to try what could be done under ordinary circumstances by the country pharmacist. Belladonna and hyoscyamus were selected.

Having a small garden containing about sixty square yards, which was a type of builders' gardens—where rubbish had been shot and veneered with a little earth—the attempt was made. The first difficulty was plants or seeds. The flora of the neighbourhood did not include the first; the catalogues of seedsmen were consulted, but no mention was made of these, and wholesale houses who were applied to could not supply them. Through the kindness of a friend a plant of belladonna was obtained from North Yorkshire; it was well laden with ripe berries, which were sown; the plant being set under the shade of a south brick wall. A year ago last spring it was pleasurable to note the appearance of a number of seedlings which grew about a foot high, and then died down on the approach of winter. This spring, as soon as they appeared they were dusted with slaked lime, which had absorbed plenty of carbonic acid, and a top dressing of Clay's chemical manure. Under this treatment they flourished and grew well, being now four feet high. The old plant made shoots last year three feet high, which died down. This spring, under the same treatment as the seedlings, it sent up half a dozen stems which average five feet high. Culpepper speaks of it as a dismal plant. It is the reverse, its fresh green colour being pleasing to the eye, and better than bare brick walls to gaze upon. The plants are bearing a number of the purple-brown flowers, which hide themselves under the leaves, and fruit is forming in the place of the earlier blooms.

With regard to hyoscyamus, the difficulties were greater. Professional growers could not supply plants. Seeds purchased would not germinate. At last, through the kindness of J. Montague, Esq., some from his garden produced young plants, but the slugs made short work of them; they evidently like the sedative principle of hyoscyamus as well as that of lettuce. Belladonna they will not touch. One plant survived its enemies and the winter's cold and

wet, but this year it followed its predecessors' fate. Professor Bentley supplied a fresh quantity of seed, as also J. Baker, Esq., of Kew; both have germinated, and some of the Professor's seedlings are a foot high. *Hyoscyamus* flourishes best on a dry soil. Their value remains to be tested, as also whether the alkaloidal principle is increased or diminished by higher cultivation. I shall be glad to supply a few plants of *hyoscyamus* or fruit of belladonna to any country chemist who will report to this Association how the plants succeed.

A vote of thanks having been passed to the authors of these papers,

Mr. J. A. BELL said he had listened with great pleasure to Mr. Hasselby's paper, and having a larger garden than he well knew what to do with, he would put in as many plants as Mr. Hasselby would supply him with, and see that they were well looked after. In May or June next year he should then probably be able to supply Mr. Gerrard with material to manipulate.

Mr. ATKINS remarked that the conditions of plant life, especially as varied by a state of wildness or cultivation, were as yet but very little understood, and further experiments ought to be made. There was a plant which grew in Wiltshire, and which some years ago was of some importance there as an industry, wild valerian. It used to be exported to America in considerable quantities, but he understood it was now cultivated there. Wild plants by a process of natural selection found out the food required for the development of their active principles. In his own neighbourhood some plants would grow on one side of a hedge and not on the other, and often on the side where he should not have expected them to grow, where they got the afternoon sun, not the morning. Two or three years ago, when at Vevey, he was told by a large vine grower, that the grapes of one field which had the afternoon sun produced a wine of much higher quality than the vines which had the morning sun. All these things seemed to show that when plants were taken from a state of nature, the conditions of their growth required very careful study.

Mr. NAYLOR asked what indicator Mr. Gerrard employed in titrating with sulphuric acid liquids containing alkaloid. He had had some experience in the matter, and was not at all satisfied with anything he had used.

Mr. SCHACHT said the value of such a communication as Mr.

Gerrard's consisted essentially in the accuracy of the results. He did not mean to impute to him any want of accuracy in his work, but as his process for estimating these alkaloids was not universally admitted to be the most accurate, he should like to know if he had systematically compared his results with those obtained by the other processes.

Mr. GREENISH said it was very interesting to hear from Mr. Gerrard for the second time that he found more of the active principle of belladonna in the leaves than in the root. Some two or three years ago Mr. Gerrard had read a paper which strikingly confirmed some very accurate experiments made by Professor Dragendorff on the henbane, and it had always been a matter of surprise to him (Mr. Greenish) that the henbane should contain more of this active principle in the leaf, while the belladonna contained more in the root. It seemed, however, from Mr. Gerrard's researches that they would have to return to the leaf again; for if the root were not the best, why use it for making any preparation in the Pharmacopœia? He apprehended the leaves could be obtained more readily, and in greater quantity than the root. He knew there was a difference in medicinal plants under cultivation, though it might be difficult to determine the exact amount of cultivation required to produce it. By continued garden cultivation the active principles were in some cases almost entirely eliminated. He did not consider merely taking a plant from its habitat and dropping it into a garden to be cultivation; it required some time for cultivation to produce its full effect.

Professor REDWOOD said that with regard to the question of using the root or leaf of a plant in cases where both were available, it was in his opinion desirable that experiments should be carried farther than, so far as he was aware, had been done as to the relative permanence of the active constituents of these two parts of the plant. There was reason to believe that the leaf was more liable to undergo deterioration from keeping than the root, certain constituents, especially chlorophyll, being of a very changeable nature. This was a point of practical importance, because if the root retained its activity more permanently, it would afford the means of making preparations at times of the year when the leaf would not be available. The discussion on the effects of cultivation upon plants had reminded him of a circumstance within his own experience. He had been trying to improve the growth of asparagus in his own garden without very good results, and his gardener, who was not very scientific, but who had strong opinions of his own, said the bed

required manuring, and especially that salt should be an ingredient. He was quite inclined to agree with him that salt should be used as a manurial agent, and finding he could buy salt much cheaper by the ton, he ordered that quantity. The gardener applied it freely to the asparagus bed, with the result that while they had a bad crop before, they got none afterwards, and on taking up the roots they were found to be quite dead. This only showed that cultivation might be carried too far, and that even fertilizers might be applied in too lavish a manner.

Mr. COOKE (Wandsworth) said in his experience there was very little difference in the permanency of the leaf or the root, if proper care were taken; but if the same kind of skill were applied to storing the leaves as Professor Redwood had devoted to the growth of asparagus, they could not expect very satisfactory results. Very little more trouble and skill were required in securing the activity of the leaf than that of the root, but it certainly required more care. The leaves should be dried as rapidly as possible at the lowest possible temperature. The root would stand much rougher treatment, and that possibly would account for the difference in medicinal qualities, which was often attributed to different parts of the plant. His experience was that the leaf when carefully dried, especially in the dark, gave better results than the root.

Mr. BOTTLE said he had been much impressed with Mr. Gerrard's remark as to finding more alkaloid in belladonna grown in his own garden in London than in that grown in the country. One could quite understand that difference of soil and atmosphere would produce a great difference in the development of plant life; but there was another element which had recently been shown to have great influence, viz., the electric light; he would like to know whether Mr. Gerrard's plants had been cultivated with this advantage.

Mr. WREN was not surprised that Mr. Hasselby had not succeeded in growing henbane from seed, as he believed all growers submitted the seeds to a process of kiln drying.

The PRESIDENT asked if that could be considered honest on the part of the dealers.

Mr. WREN said it would be as well not to answer that question, as the English growers were well known; but he believed the Germans made no secret of it.

Mr. HOLMES thought Mr. Gerrard had very clearly shown that the belladonna root could not be divided with profit. Lavender and several other plants were often propagated in that way, with the result of ultimate failure, as the plants generally died of

fungoid disease. The question whether root or leaf should be used in medicine was a very important one. Mr. Gerrard had shown that the leaf was as rich in alkaloid as the root, but he could not agree with him that the root should be used for liniment. As far as he could ascertain, the root which chiefly came into the market was imported from Germany, and was very carelessly collected; indeed he had not been able to get a good specimen for some years past. Those who cultivated the root in this country chiefly used it themselves, or if any came into commerce it was probably that which came from plants that had yielded leaves for at least three years, and as there would be so much difficulty in getting good roots, he should imagine it would be better to use well-dried leaves. Mr. Hasselby's remarks were very interesting, though he believed the biennial plant did not grow a foot high the first year, but the leaves spread on the ground like a mangold wurzel or turnip, without a stem, while the annual rose up at once into a stem. He quite agreed with him that if the plant were properly cultivated with a view to develop certain qualities, it would be preferable to the wild variety; but when plants were cultivated with a view to produce flowers and seeds, the circumstances would not always be such as would tend to develop the alkaloids. He had only seen belladonna growing on a calcareous soil, either chalk or limestone, and therefore it was very likely that the addition of lime to the soil would be useful. There was no doubt that the morning or afternoon sun had a different influence on many plants, but he did not know whether it affected belladonna. He had found belladonna growing on the Kentish hills with a southern aspect, also in a wood with an eastern aspect, where it grew 4 or 5 feet high, and also with a western aspect to the average height; but in every case it was on a declivity, so that good drainage was probably essential to its successful growth. With regard to henbane, a friend in the north had promised him some seed when it was matured, and he would forward some to Mr. Bell. It was very difficult to get good henbane seed in commerce; many other seeds were often adulterated and dried by heat, and a purchaser could not be sure of what he got from a dealer. He found it was the practice in some cases to break up the henbane leaves into small pieces, which he thought objectionable; for though the specimens he had examined had been of excellent quality, it was not possible for an ordinary observer to distinguish them accurately in that form.

Mr. MARTINDALE said the belladonna root made a far cleaner liniment than the leaves, if of the same strength, the chlorophyll in

the leaves making the preparation dirty, as belladonna plaster generally was. It was desirable on this account, and also for economy's sake, to employ both leaves and root. The plant might be used for a few years to produce leaves, and then it might be dug up and the root used for liniment; and the preparation of the alcoholic extract of the root by distilling off the spirit. As mentioned by Mr. Balmer, some years ago, an extract which could be made more easily and conveniently than by the present method would certainly be valuable, especially for suppositories. Any practical pharmacist who had to make suppositories containing two or three grains of the ordinary extract of belladonna, knew the difficulty there was in making them presentable; the other preparation, being much more active, might be mixed readily with cacao butter, or whatever excipient were used, and made a better article than that given in the Pharmacopœia.

Mr. GERRARD, in reply, said he had been particularly interested in Mr. Hasselby's paper, and he should like to ask him if he were certain he could distinguish in the plants which grew in his garden annual from the biennial variety. Had they all an upright growth and tendency to flower, or were some of them flat like cabbage plants?

Mr. HASSELBY said none had flowered; they were seedlings of three months' growth, about twelve inches high; there was no tendency to flower, the leaves all sprang from the root.

Mr. GERRARD said he was glad of this opportunity to say something about henbane, which he had paid a great deal of attention to for some two or three years. He had experienced the same difficulty in getting plants as had been mentioned, but had overcome it now through the kindness of a farmer in Warwickshire, who was this year cultivating three acres. They managed to get some wild henbane plants from which a few ounces of seed were obtained, and this was thrown about the corner of a field, the soil of which was very rough, and where scarcely anything else would grow. The first year the plants came up most curiously. Amongst them they found a few cabbage-like plants, but the majority grew two or three feet in height, and branched off considerably. Then, again, they found the so-called annual variety, which was simply a flowering stalk twelve inches high. What were these varieties? One was a simple stalk a foot high, bearing a head of flowers; the other plant was two or three feet in height, giving off large branches; and then, again, there was the so-called first year's biennial variety, which simply produced small cabbage-like plants. Last year a

considerable quantity of seed was collected and about three acres were planted, and this year the result had been the same, or nearly so. The supposed biennial flat plants had been left in the ground, and they were now growing up and were going to flower. There was evidently something here which needed explanation. There were either three varieties, or one was a hybrid; but he hoped to be able to clear up the matter in another year. He could not agree that it was easy to distinguish between annual and biennial henbane as regards colour of petals. It was said that 90 per cent. of the flowers of the annual variety were yellow, whilst those of the biennial had a purple tinge. But his experience was almost the direct contrary: there were as many yellow flowers on the biennial variety as purple. Mr. Hasselby had put the question, What was a cultivated plant as distinguished from a wild one? He considered that a wild plant was a self-sown one, and was more hardy, having been self-sown for years and thriving in the particular locality. If you took seeds from such a plant and placed them under cultivation, the plant became altered in form, less hardy, and required more care and attention. There was a good example of that in the camomile, there being a great difference between the wild and cultivated kinds. What the influences were which produced the difference he would not pretend to say, for it was a very deep subject. He should be glad to accept Mr. Bell's offer to send him plants for examination, although he had now secured a fair supply. The only way to decide between the annual and biennial plant was to work out the difference in the percentage of alkaloids contained in them; but it would never pay any one to grow the annual henbane while he could grow the biennial, it being so stunted, and having such a small weight of leaf. His experience agreed with Mr. Naylor's, that it was very difficult to decide on a good indicator for the percentage of alkaloid; he had tried phenolphthalein, but had come to the conclusion that litmus was the best after all, and generally used that. Phenolphthalein had some advantages, but for a good all-round indicator he preferred litmus. In reply to Mr. Schacht, he considered the process very fairly accurate. He used ether as the solvent, which abstracted nothing from the belladonna but these alkaloids, which might be assumed to be either atropine or hyoscyamine; they both had the same molecular weight, and, therefore, had equal neutralizing power. The residues he got might either consist wholly of atropine or hyoscyamine, but it made no difference whether he measured them as one or the other. In his paper he stated them simply as alka-

loids, and the acid he used neutralized nothing but those alkaloids. He considered the method therefore very fairly accurate, though not absolutely so. Professor Redwood had referred to a matter of considerable importance, viz., that the leaf might deteriorate more than the root by keeping, and his experience agreed with that statement; for unless very carefully prepared, the leaf lost almost the whole of its activity in the course of one or two years. He had purchased belladonna leaf commercially, and could not say that it was of the good quality Mr. Holmes had described, for he had found it yield scarcely any atropine whatever. There was certainly an opening for pharmacists in the country to undertake the cultivation of these medicinal herbs. If they attended to the gathering of the leaves at the proper time, and dried them rapidly, they would get a much better product than that usually sold.

The Conference then adjourned for luncheon.

Upon resuming, the first paper read was a—

REPORT ON AN INVESTIGATION OF THE CHEMISTRY,
BOTANY, AND PHARMACY OF THE
STRYCHNOS NUX-VOMICA.

By WYNDHAM R. DUNSTAN, F.C.S., AND F. W. SHORT.

In the present report it is intended to give in general outline an account of an investigation with which we have been occupied during the past two years, and which has in part been endowed by a grant from the Research Fund of this Society. The investigation had for its objects: (1) The elaboration of a simple and accurate process for the extraction and estimation of the total alkaloidal constituents of the seeds of *Strychnos Nux vomica*; (2) the discovery by analysis of authentic specimens, whether the alkaloidal content of the different seeds was subject to much variation; (3) the quantitative separation of the alkaloids strychnine and brucine by a simple and accurate process; (4) the chemical and botanical analysis of the whole plant, in order to see whether the alkaloidal content was in any way connected with distinct botanical characteristics; (5) a complete chemical examination of the galenical preparations of nux vomica that are found in commerce; (6) to devise processes for the production of standard galenical preparations, whereby the therapeutic action of these preparations shall be rendered as far as possible definite.

The results of this inquiry have formed the subjects of ten papers

which have been published in the *Pharmaceutical Journal*, nearly all of them having previously been communicated to the Pharmaceutical Society or to this Conference.

The investigation was commenced in the early part of the year 1882, and the first results were communicated in a paper read before the Pharmaceutical Society in February, 1883. In this paper (*Pharm. Journ.* [3], xiii. 665) we described the results of a great number of experiments which were made in order to elaborate a simple process for estimating the amount of total alkaloid in the seeds. It was here shown that the whole of the alkaloidal constituents of the seeds could be most advantageously extracted by a boiling mixture of chloroform containing 25 per cent. (by volume) of alcohol, and upon this fact a process was founded for the estimation of the total alkaloid, the latter being separated from the above solution by agitating with dilute acid. In the same paper it was shown by analysis that commercial specimens of the powdered seed varied to the extent of 1 per cent. in total alkaloidal content. In a second paper (*Pharm Journ.* [3], xiii. 1053) we described the results of a botanical and chemical examination of some authentic specimens of the different seeds that enter the British market under distinctive names. It was shown that these specimens differed in certain botanical characters from those described by many authorities. In analysing the seeds a process similar to the one just described was employed. Two distinct sets of specimens were analysed, the one collected in 1877, the other in 1883. The results showed (1) that nux vomica seeds contain much more alkaloid than is ordinarily supposed, the richest of the specimens yielding nearly 4 per cent.; (2) that the seeds which enter the British market stand in the following order of alkaloidal content: Bombay, Cochin, Madras. The results of the chemical and botanical analysis are incorporated in a tabular form in the original paper. The differences then observed might indicate the existence of a distinct species of the plant, or might be exhibited by the same seed in different stages of development. This question we were unable to settle at this stage of the investigation, owing to there being no authentic specimens of the entire plant available in this country. Through the kindness of Dr. Ondaatje, of Galle, Ceylon, we were subsequently supplied with the necessary specimens, and while these were in course of preparation we commenced experiments upon the separation of the alkaloids strychnine and brucine. In a paper read at a meeting of this Conference at Southport last year, we described a process for the quantitative separation of these alka-

loids, which is dependent upon the difference in the solubility of the two ferrocyanides in dilute sulphuric acid. The process, although not at first ensuring an absolute separation, gives results that are perfect from an analytical point of view, and is the simplest and probably the most accurate process that has yet been proposed. Having got so far with the chemical investigation of the subject, we were in a position to examine the galenical preparations which are made from the seeds. With this object we applied to the Research Fund of the Conference for a grant to aid in the examination of the alkaloidal value of the galenical preparations of nux vomica then in commerce. In a paper read at the last meeting of this Conference (*Pharm. Journ.* [3], xiv. 292) a process was described for estimating the alkaloids in the tincture of nux vomica. In the same paper the result of the analysis of the strychnine and brucine in twelve commercial specimens of tincture of nux vomica was given, which showed that not only was the quantity of total alkaloid subject to variation, some specimens containing twice as much as others, but the relative proportion of strychnine to brucine also seriously varied. In a subsequent communication to the Pharmaceutical Society (*Pharm. Journ.* [3], xiv. 441), the causes of these variations were investigated, and it was then shown that in addition to the fundamental fact that the seeds of commerce vary in alkaloidal content, the strength of the spirit used makes a great difference in the quantity of alkaloid extracted. The results showed a mixture of 100 volumes of rectified spirit with 25 volumes of water to be the best solvent for extracting nux vomica. These results were confirmed by the appearance of a very careful paper by Mr. M. Conroy, who arrived at practically the same conclusion. In the paper just referred to, we also pointed out the fallacy of attempting to make a tincture of nux vomica of definite strength by determining the amount of total extractive matter it contains, such as is attempted in the Pharmacopoeia of the United States. In addition it was shown that a stable tincture of nux vomica could not be prepared by dissolving the ordinary commercial extracts in alcohol. The commercial extracts of nux vomica were now examined, and in a paper read before the Pharmaceutical Society (*Pharm. Journ.* [3], xiv. 443), a process was described for the estimation of the alkaloid in extract of nux vomica, which is similar in principle to that adopted in the analysis of the tincture of nux vomica. The analysis of twelve commercial specimens indicated a serious want of uniformity in the alkaloidal content.

Thus our report upon the commercial pharmaceutical preparations

of nux vomica was decidedly unfavourable, and showed that in all cases there was a lack of uniformity which was of grave importance from a medical point of view. For this reason a new series of experiments was commenced, with the view of preparing pharmaceutical preparations of nux vomica that should be as far as possible constant in alkaloidal strength. In a communication to the Pharmaceutical Society, we have proposed a method for preparing a standard extract of nux vomica, that is an extract that shall contain a constant quantity of total alkaloid. Total alkaloid was, after much consideration, taken as the standard of constancy, rather than strychnine alone, for reasons that have been discussed by one of us elsewhere (*Pharm Journ.* [3], xiv. 875). The method proposed for the preparation of a standard extract of nux vomica consisted in first preparing, by maceration and percolation with spirit of a definite strength, a strong tincture of nux vomica; to estimate the amount of total alkaloid in this tincture; and then to evaporate a given volume of it until it had a definite weight. Fifteen per cent. was taken as the standard of total alkaloid. The reasons for adopting this particular strength are fully discussed in the paper, not the least important being that this represents the strength of an average commercial extract of nux vomica, and is consequently the strength which is relied upon in medicine. Then again, it has been found from numerous experiments that, working with a good commercial specimen of nux vomica, it is always feasible to prepare a standard extract of this strength which possesses the ordinary physical characters of an extract, while this would not be the case if other standards were adopted. In another communication to the Pharmaceutical Society (*Pharm. Journ.* [3], xiv. 622), a method was proposed for preparing a standard tincture of nux vomica, that is a tincture which contains a constant quantity of total alkaloid. The exact standard of constancy was again in this case deduced from the analyses of tinctures which are at present used in medicine, an average specimen of which contains about 0.24 per cent. of total alkaloid. This percentage, which is equal to one grain of total alkaloid in one ounce of tincture, was therefore adopted. It was shown that the preparation of the standard tincture could be accomplished in two ways—(1), by the dilution of the assayed percolate, alluded to before, to a definite degree with spirit; or, (2), by the solution of a definite quantity of the standard extract in a certain volume of spirit, the latter being of the same strength that was originally used in making the extract. In either case a perfectly stable tincture results. This

paper concluded the report upon the pharmaceutical preparations of nux vomica, for which a grant from the Research Fund of this Conference had been made; or, rather, the report covered more ground than that for which the grant had been made, namely, an examination of the commercial preparations of nux vomica. From a pharmaceutical point of view, this part of the subject had now been fully worked out.

The specimens of the nux vomica plant had now arrived from Ceylon, and we therefore commenced a complete chemical and botanical examination of them. In a paper communicated to the *Pharmaceutical Journal* [3], xiv. 1025), we have described the principal reactions and properties of a new glucoside that we had isolated in large quantity from the pulp of the fruit, and in small quantity from the seeds of *Strychnos Nux-vomica*. The glucoside we have called "loganin," and we propose at a future time to minutely investigate its chemical constitution.

The last paper (*Pharm. Journ.* [3], xv. 1) contained the results of a very laborious and detailed investigation of the chemistry and botany of the *Strychnos Nux-vomica* indigenous to Ceylon, specimens of which had been collected by Dr. Ondaatje. The more important results reached may be thus summarized. The poisonous nature of the pulp which contains the seeds within the fruit was experimentally demonstrated by physiological experiment, and subsequently confirmed by chemical analysis, which showed the presence of 1.4 per cent. of strychnine, and 1 per cent. of brucine. In addition to these alkaloids, the glucoside loganin exists to the extent of nearly 5 per cent. The results of the investigation showed that there was no evidence of the existence of a different species of the plant, but that the variation in the alkaloidal content of the seeds was fully accounted for by difference of development. The results obtained allowed us to formulate the facts in the following general statement or law. The alkaloidal content of the seeds is directly as their size and inversely as their number in the fruit. The seeds of the *Strychnos Nux-vomica* indigenous to Ceylon are particularly remarkable for their high alkaloidal content. One specimen of the seeds contained 5.34 per cent. of total alkaloid, a quantity far in excess of that which is usually supposed to exist in the seed of this plant.

The paper was illustrated by drawings from the living plant which were taken by Dr. Ondaatje, and contained tables exhibiting the results of the chemical and botanical analyses of the seed.

The PRESIDENT moved a vote of thanks to the authors, whose absence he regretted, and suggested that as the paper dealt to some extent with the question of standard strengths, though that was not the only one involved, any discussion upon it might be taken in connection with the subsequent papers by Mr. Schacht and Mr. Dott.

The next paper read was entitled—

NOTES ON THE ESTIMATION OF HYDROCYANIC ACID AND CYANIDES.

By LOUIS SIEBOLD, F.I.C., F.C.S.

I have on a previous occasion called attention to the serious errors to which Liebig's process for the volumetric estimation of hydrocyanic acid is liable if the titration be conducted in the presence of less alkali than is requisite for the complete conversion of the acid into sodium cyanide (*Year-Book of Pharmacy*, 1874, 568). The failure of litmus to indicate the point of neutralization, and the advice given in standard text-books to avoid an undue excess of soda, were mentioned in that paper as causes but too likely to lead to the serious error alluded to, especially as this failure of litmus as an indicator and the injurious results of the use of an insufficient amount of alkali had never been pointed out either by the author of the method or by standard works on analysis. Since that time various suggestions have been made for guarding against this source of error. Dr. A. Senier recommended that a small proportion of soda should be used at the beginning of the titration, just enough to react with litmus, and that further additions of alkali should be made as soon as it was found that the continued action of the silver nitrate solution caused this alkaline reaction to cease, taking care in this way that the mixture was still alkaline at the end of the process. He thus made sure of the use of a sufficient proportion of soda, and guarded at the same time against a slight error known to be caused by the application of a large excess of alkali (*Year-Book of Pharmacy*, 1878, 520). When these suggestions were communicated to the Dublin meeting of this Conference, I expressed a doubt as to the expediency of this plan, on the ground that during the greater part of the titration the mixture would contain hydrocyanic acid in the free state, and that the loss of a small portion by volatilization would thus be difficult to avoid. Since that time I have had many opportunities of

satisfying myself that these apprehensions were well founded, and that the accuracy of the process under these conditions depends on the rate of speed at which the titration is performed. The loss of H Cy thus suffered may vary according to temperature and speed of working, from mere traces up to as much as 10 per cent. of the actual proportion present.

More recently, Mr. P. MacEwen has suggested the use of phenolphthalein in the place of litmus; but since sodium cyanide is not without action on this substance, even in the presence of free hydrocyanic acid, this plan is open to the same objections as the one just referred to. The crimson colour of the mixture, moreover, renders the precise recognition of the end of the titration with silver nitrate somewhat more difficult. What then is the best mode of working this test? In dealing with this question I wish to remind the meeting, in the first instance, that an excess of alkali, unless quite unreasonably large, does but affect the result to a very slight extent, and, therefore, does not impair the test for ordinary pharmaceutical purposes. If, however, absolute accuracy be desired, let me recommend the use of standard soda solution in the place of one of unknown strength, and the performance of a preliminary titration in the presence of a very decided excess of alkali, having for its object an approximate estimation of the hydrocyanic acid present, and consequently of the quantity of soda solution required. The second titration may then be carried out with the full knowledge of the amount of soda required, and by exceeding this proportion very slightly, so as to ensure slight alkalinity lasting to the end of the titration, highly accurate results are obtained. This is especially the case if the measured quantity of soda be introduced into the beaker first, and the acid allowed to flow to it from a burette, so as to prevent even the slightest loss by volatilization. I know of no other process of analysis superior to this in accuracy, if this mode of working be adopted.

At last year's meeting of the Conference I referred to the process of the United States Pharmacopœia for estimating the strength of hydrocyanic acid, in which an excess of calcined magnesia is used instead of soda, and the addition of the decinormal silver solution continued until the whole of the cyanogen is precipitated as silver cyanide, the end of the reaction being indicated by means of potassium chromate. The favourable opinion I then expressed regarding the accuracy of this method I have since confirmed by further estimations; but I must add that it is hardly equal in this respect to Liebig's process, worked in accordance with my sug-

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gestions, and has the disadvantage of being impaired by the presence of hydrochloric acid or chlorides. Speed of working, in this case, is an absolute condition to absolute accuracy, since the action of hydrocyanic acid on magnesia is incomplete, and remains so until one half of the total silver solution required for the process has been added, and hence there is liability to loss by volatilization. To prevent this it is best to place the magnesia in a beaker, along with the potassium chromate, then to add the hydrocyanic acid from a pipette, and now rapidly to run in the silver solution from a burette, until the red coloration produced on the surface begins to disappear less quickly on stirring, after which the remainder of the silver solution may be added drop by drop until the reaction is completed. Worked in this manner the method gives excellent results, especially as the volume of silver solution required is double that of the one consumed in Liebig's process.

I have now to report that if the precautions just described be duly observed, the carbonates of magnesium, calcium, and barium can be substituted in this process for the magnesium oxide, though in the case of barium carbonate a much larger proportion is needed than in the other cases. What I just stated respecting the action of the various carbonates of the alkaline earths holds true of the substances not only obtained by precipitation, but also of the corresponding native minerals, such as chalk, calc-spar, magnesite, etc. I do not recommend these substances to be used in the place of calcined magnesia, but merely wish to record, as an interesting chemical fact, the observation that a body of such extremely weak acid properties as hydrocyanic acid, which by itself is without action on these minerals, can be made to decompose them completely, and even without heat, by the intervention of silver nitrate.

Further experiments respecting the double cyanides formed in these titrations are still in progress.

The PRESIDENT, in proposing a vote of thanks to Mr. Siebold, remarked that this paper was in continuation of one read last year on the American process, which the author then seemed to prefer to Liebig's, but he now seemed to have somewhat modified that view. Of course Liebig's process required certain precautions, but the differences which occurred with careless manipulation were overcome by Mr. Siebold effectually. This process of using double titration, he was sure, would give results of the greatest possible accuracy.

Mr. NAYLOR asked what was the real objection to the mercuric chloride test. His experience was that it was very accurate.

Mr. SIEBOLD agreed with Mr. Naylor that that process was very accurate; it had proved so in his hands at any rate, though in one well-known book it was condemned. He did not exactly know how Mr. Allen, the author of that book, arrived at this conclusion. At the time the book was published, he had some conversation with him about it; at that time he (Mr. Siebold) had had but very little experience with the test, but since then he had repeatedly tried it, and had convinced himself it was very readily applicable and accurate, though he could not see that it was superior to Liebig's process. Possibly the reason Mr. Allen did not approve of it was that he had not got very accurate results by Liebig's process for comparison, that process being liable under certain conditions to give inaccurate results.

The next paper read was—

FURTHER CONTRIBUTION TO THE PHARMACY OF LINSEED.

By THOMAS GREENISH, F.C.S., F.R.M.S.

In a former communication on this subject, read at the British Pharmaceutical Conference held in Edinburgh in 1871 (*Pharm. Journ.* [3], ii. p. 211), attention was directed to *farina lini* as defined in the British Pharmacopœia, and to the character of the linseed meal at that time met with in many pharmacies.

There were exhibited on that occasion samples of linseed from the several countries on which this market was dependent for its supplies, with the view of showing not only the difference between the seed grown in a northern and that grown in a southern climate, but also the kind, character, and relative proportions of the weed seed, which were found to accompany more or less every sample of linseed, either as adulterants or the result of careless harvesting of the seed.

At the same time attention was specially directed to the presence of cruciferous seed, as, for instance, the wild mustard and the rape, among the weed seeds which accompanied in a greater or lesser proportion almost every sample of linseed that found its way into the English market, either for the production of linseed oil, linseed cake for fattening cattle, or the crushed linseed for pharmaceutical purposes. It was pointed out that these seeds being present, and in

some samples to a considerable extent, there would be a consequent development of an acrid volatile oil, which must ensue on the addition of water in the formation of a poultice, the cataplasma lini, or any other of the cataplasms in which linseed meal forms one of the ingredients.

For the sake of clearness it seems desirable to recapitulate, without needless repetition, some of the remarks made on that occasion. In the London Pharmacopœias of 1836 and 1851, *sem. lini contrita*, rendered "bruised linseed," was directed to be employed in making cataplasma lini and the other cataplasms into the composition of which linseed meal entered; but in the British Pharmacopœia of 1868 this article is headed "*farina lini*," translated "linseed meal," and described as "the cake of linseed from which the oil has been pressed, reduced to powder," and in the formula for the production of cataplasma lini, olive oil is directed to be added in the proportion of half an ounce to four ounces of the meal.

In the paper to which reference has been made, *farina lini*, the produce of linseed lightly crushed, was strongly recommended as the best adapted for pharmaceutical requirements. But there were a few points which could not then be cleared up without the assistance of some one practically engaged in the crushing of linseed, as for instance, the kind of seed best adapted for the production of *farina lini*; the amount of oil, if any, that should be removed by submitting the seed to pressure before or after its conversion into meal; and the quantity of husk, if any, that should be sifted out and separated from the linseed meal, so that a *farina lini* may be produced the most suitable for the requirements of the Pharmacopœia, in the best condition for keeping, and in every respect abreast of the advancement of pharmacy. If apology were needed for again referring to this subject, it will be sufficient to state that the pharmacy of linseed is in an incomplete state, and that an article of the *materia medica* which has a place in five preparations of the British Pharmacopœia, is admitted by pharmacists to be capable of improvement, and it must be accepted as most desirable that the description of the product in the National Pharmacopœia should correspond with the method generally recognised as the best for the production of a *farina lini* capable of fulfilling all the requirements of the Pharmacopœia.

It may be as well at this stage of the inquiry to pass in review the several kinds of linseed meal as usually met with in commerce; this course will afford the opportunity of discussing the merits or demerits of each, and their applicability to the requirements of an

official preparation. The samples on the table will serve as illustrations.

The source of the present official preparation is the cake of linseed, from which the oil has been pressed, reduced to powder. The linseed cake of commerce is the result of the pressure of the seed either for the sake of the oil employed in the arts or for the cake used in fattening cattle. The farina lini from this source is therefore a bye-product; and without again entering upon a question, referred to in the former paper, as to the extent to which contaminated seed may have been used in the commercial production of the cake, although it has an important bearing on the present question, I hold it as very undesirable that the linseed meal of the Pharmacopœia should be a secondary product.

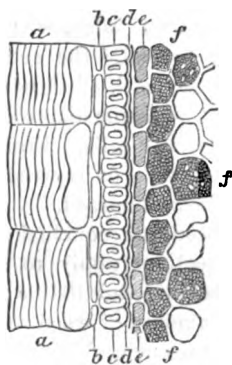


FIG. 1. TRANSVERSE SECTION OF LINSEED. (After Vogl.) *

- a. Epidermal cells. b. Layer of elongated cells. c. Fibrous cell layer. d. Layer of thin cells. e. Layer of pigment cells. f. Cell tissue, with the farina and globules of oil.

When pressure is exercised on the seed, as in the manufacture of the cake, the oil, represented by the globules observed in the drawing, passes through the farina on its way to the surface for collection, and must necessarily saturate with oil the whole mass, so that the extent of oily surface exposed to atmospheric influence and the liability to oxidation must be enormously increased; for this reason alone grave objections must always apply to the cake as a source of the farina lini. Besides, the most contaminated seed may have been used in the manufacture of the cake, needing only the addition of

* The woodcuts of this and subsequent illustrations were kindly lent by the Editor of the *Pharmaceutical Journal*.

water for the development of an acrid volatile oil never contemplated in the formula for making the linseed cataplasm.

In the first instance the natural oil is removed from its own cells in the seed, and its oxidation consequently promoted, and then about the same percentage of olive oil is directed to be added in making the poultice. Of course it is possible to employ a pure cake in the manufacture of the meal, but even with that condition the very strongest objections apply to the process of its manufacture, which I have just commented on. The farina lini from this source and corresponding with the instructions of the British Pharmacopœia is a dry meal, and represented by sample No. 1.

There are here two samples of light crushed linseed; in neither of them has the seed been subjected to any process beyond that of being lightly crushed. No. 2 represents the crushed linseed as it falls from the rollers. No. 3 the same, with about 20 per cent. removed, as husk, in order to make the article approximate more closely to the term meal. In both of these samples, Nos. 2 and 3, there has been the smallest possible disturbance of the oil from its natural position in the several cells. From No. 2 about 20 per cent. has been removed as husk, as represented in No. 3; this is known as the best light crushed linseed.

From what I have stated, my conclusions will have been anticipated, that serious objections apply to any linseed cake as a source of the official farina lini; and that a linseed rich in farina, with the smallest possible amount of weed seed (and Bombay linseed as a rule fulfils these requirements), lightly crushed between iron rollers without the removal of any oil, should be the source of the farina lini of the Pharmacopœia. The removal of about 20 per cent. as husk makes it approximate more closely to a meal, and is in no way detrimental to its future employment in the several Pharmacopœia cataplasms.

In being lightly crushed, the oil in its natural cells is scarcely at all disturbed, and therefore, but slightly exposed to oxidation from atmospheric influences. The product contains the whole of the oil, averaging from 30 per cent. to 33 per cent. originally present in the seed.

This farina is not a secondary product, but prepared especially for the requirements of the pharmacist. It will keep good for several months, which may be considered a reasonable length of time, under the ordinary conditions of storage in a pharmacy.

Sample No. 4 is the light crushed linseed as represented in No. 2 without the removal of any portion of the husk; but after being

crushed it is subjected to the action of edge-runners, which by their pressure distribute the oil throughout the entire mass. The result is a greasy meal, inelegant, with an increased liability to oxidation due to that part of the process which has reference to the edge-runners. This substance is not suited for general use in pharmacy.

I have stated that preference is given to the sample of crushed linseed No. 3, and that it is known by the term "best light crushed linseed." It is No. 2 with about 20 per cent. removed as husk. The question may be asked here, if the removal of 20 per cent. be an improvement, in that the result more nearly represents a true meal, why not take out the whole of the husk, so as to make *farina lini* approximate to *farina tritici*?

In detailing the result of some experiments on this subject, it will be seen that although 20 per cent. of husk may be removed with advantage to its appearance and no disadvantage to its employment for cataplasms, yet the entire husk could not be removed without the loss of a quality that seems very desirable in a poultice.

It will be necessary here to refer to some curious points in the economy of plant life for an explanation of my reasons for this conclusion. Referring again to the drawing Fig. 1, a transverse section of linseed, the epidermal cells (*a*) are observed, in which, in contact with water, vegetable mucilage is formed and exudes, yielding a gummy solution familiar to the pharmacist in the preparation of infusion of linseed. If a cataplasm be made of No. 3 sample of *farina*, or, which is the same thing No. 2 with about 20 per cent. of husk removed, a plastic cataplasm is the result; but if the greater part of the husk be removed, sufficient vegetable mucilage, which proceeds from the husk, is not formed to give the poultice a plastic character, and the result is a semi-liquid paste rather than a poultice, which will not hold its place when applied, being deprived of that adhesive property given to it by the vegetable mucilage. This vegetable mucilage is due to a transformation of cellular tissue into other substances, a change which frequently occurs in plant life, some of our gums being thus produced. Somewhat similar in its nature to the formation of gum is the conversion into mucilage of the epidermal cells of many seeds, as in that now under consideration, the linseed; also the quince, fleabane, and mustard seed. When placed in water the cell wall becomes excessively thickened, the innermost layers swell, burst the outer layers, and discharge a transparent substance called vegetable muci-

lage, differing in its character from that which is known to the pharmacist as mucilage, in that it is not precipitated on the addition of spirit, and differing also from albumen in not being coagulated by heat; neither is it a secretion of the cell. This change may be observed in placing a thin transverse section of linseed under a cover-glass. With spirit as a medium, no change takes place; but on the addition of water, the separation of laminæ, less formal than that indicated in the drawing, with the formation of the mucilage, will be gradually developed.

The second drawing, Fig. 2, has no reference to this paper, but is a longitudinal section showing the typical cell tissue, *c* and *d* in the drawing, Fig. 1, by which linseed is detected under the micro-

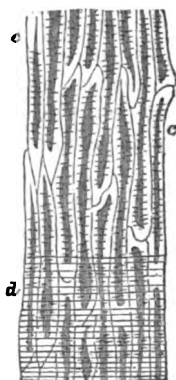


Fig. 2.—Typical combination of Cells characterizing the Linseed Husk, corresponding with the letters on Fig 1. (After Vogl.)

scope when it occurs as an adulterant, or in some combination where it should have no place.

Another question of some importance will also suggest itself: How should the linseed meal of the future be described in the Pharmacopœia? The definition should be somewhat broad, or the pharmacist may be harassed by the public analyst. Probably a return to the term *sem. lini contrita* of the Pharmacopœias of 1836 and 1851, and the description "crushed linseed," would be sufficiently definite, leaving the elegance of the preparation to the discretion of the pharmacist. The dry and generally impure linseed meal, the produce of the cake deprived of its oil and ground to powder, will still be kept by the wholesale dealer for the supply at a cheaper rate of the wants of a poor neighbourhood, and as a

material for luting the steam apparatus of the pharmacist, for which the crushed linseed is not adapted; but the pharmacist owes it to his calling to bring his educated intelligence and his practical knowledge to bear on the improvement of any preparation between the issue of successive Pharmacopœias, so that each succeeding one may fully represent progressive pharmacy.

I am indebted to the firm of Sadler, Firth & Ross, seed crushers, Great Guildford Street, Southwark, for much practical information, for their courtesy in allowing me to see the crushing mills in operation, and also for the samples I have the pleasure of exhibiting in illustration of this paper.

A vote of thanks having been passed to Mr. Greenish,

Professor REDWOOD said he did not at all object to the general purport of Mr. Greenish's recommendation with reference to linseed meal. Formerly he was opposed to the recognition of crushed linseed in the Pharmacopœia as linseed meal, and he still was not prepared to admit that the term used in the London Pharmacopœia, *semina lini contrita*, signified crushed linseed. The word *contrita* was translated by Mr. Phillips, the author of the Pharmacopœia, as powdered linseed; whilst at the time the Pharmacopœia was published, in 1836 and 1851, crushed linseed was certainly not in common use amongst pharmacists, and at the earlier date he was not sure it was ever met with. At any rate, he knew that in some of the first establishments in London such a thing was never used, or recognised in any way as linseed meal. He considered, therefore, that what was intended in the London Pharmacopœia was the article in common use, viz., linseed which had first been crushed, and the oil extracted, and then the cake reduced to a powder. At the time when the British Pharmacopœia was being drawn up, he was under the impression, derived from his own observations and corroborated by what he had learned from others, that the crushed linseed which was then coming into use as the basis of poultices was not approved by all who used it, especially that it was liable to become mouldy when kept in a closed vessel, and that on that account many gave the preference to the older preparation. The authors of the British Pharmacopœia were of opinion that the older preparation, if used with a small portion of oil, was preferable to the newer kind of crushed linseed containing its own oil. Since then, seeing that crushed linseed had largely superseded the older preparation, he had come to the conclusion that it would be wise

to recognise it. But still there were certain considerations which had to be borne in mind. Allusion had been made to the effect that linseed was very liable to adulteration, especially by cruciferous seeds, which yielded an irritating product when made into paste with water, and which required to be specially guarded against. But was there not more liability to this contamination in crushed linseed prepared especially for pharmaceutical purposes, than in the powder produced from seed from which the oil had been removed? Mr. Greenish, he saw, shook his head, but he would throw out a few points for consideration. It was well-known that for many years there had been considerable difficulty in obtaining pure linseed oil, and this was a serious complaint with painters, because the seeds from which the oil was extracted contained foreign seeds yielding oil which had not the same drying properties as pure linseed oil possessed. The consequence had been that oil merchants and oil pressers had resorted to the most stringent means for excluding all linseed containing these cruciferous seeds, and a society had been formed in London, and maintained at a large cost, the secretary having a salary of £800 or £1000 a year, and having a large establishment under him, and all linseed to be used for oil-pressing was now subjected to the most careful scrutiny, especially as to the proportion of foreign seeds it contained. He took it therefore that the oil now produced for painters was made from the purest possible seed. But it would require great care and very nice observation on the part of pharmacists to guard against the use of inferior seeds which had not been passed by the Linseed Association of London, where they were all microscopically examined; and which inferior seeds would be very likely to be crushed for pharmaceutical use. It would be looked upon, commercially and economically, much more important to importers and dealers on a large scale to be able to supply seed which would yield an oil which was above suspicion, than to supply a good article for pharmacy; therefore, although he had come to the conclusion that crushed linseed must be recognised, he wanted to see some means of excluding from it those inferior seeds which were not fit to be used in pharmacy any more than for the extraction of oil.

Mr. WRENN said he was much interested in this subject, and had thought of introducing it himself. Having occasion to apply for a quotation for linseed cake for the production of linseed meal, he found the dealer would not guarantee its purity, saying if pure cake were required it would have to be specially prepared. The

first thing requisite was to get rid of the round, irritating seeds, which were principally cruciferous. Now, in a ramble in Hertfordshire, he had come across an agricultural implement manufacturer, who was just introducing to farmers a machine for the separation of round seeds from wheat and oats, which consisted of a long cylinder revolving at an angle of 15° to 20° , and having a number of holes perforated in it, through which the round seeds escaped, whilst the wheat and oats fell to the end. It struck him that a small machine of similar construction might very well be employed by pharmacists for clearing linseed, and they could then, with a small mill, crush their own linseed as it was required.

Mr. BORLAND thought Mr. Greenish had failed to show any reason for removing 20 per cent. of the husk, which must at the same time remove a large percentage of the mucilaginous cells. If the 80 per cent. of husk allowed to remain were an advantage, why should the 20 per cent. be removed? He would also direct attention to other adulterants which were found in linseed meal. A short time ago a sample was submitted to him for examination which contained undoubtedly cereal grains, and by the ordinary iodine test starch granules were immediately detected. On referring to some works on the subject, he was astonished to find that linseed, as sometimes met with, which had been collected when the seeds were unripe, contained a considerable quantity of starch, but when thoroughly ripe they contained no starch at all. This, therefore, was a ready means of ascertaining whether the linseed had been collected at the proper time, and showed again the importance of a knowledge of physiological botany.

Mr. FRAZER said his house had sold nothing but pure crushed linseed since 1838: no complaint had been received from any customer, whilst a higher price had been obtained for it than was given for the ordinary linseed meal. There was no difficulty in getting good seed if you gave a good price.

Mr. HOLMES said he had had the opportunity of examining a large number of samples of linseed, and had also visited the establishment of the Linseed Association, and his experience agreed with Mr. Frazer's, that any one who would pay the price could always get perfectly pure linseed, but if not, it could be got of any quality required. There were three varieties in commerce which were generally tolerably pure, the English, the Dutch, and the Sicilian. The English and Dutch were both small and dark; the Sicilian was rather large. Mr. Greenish recommended the Bombay, the specimen shown being rather a large seed, and he should

like to ask him whether he recommended large or small seed as best suited for pharmaceutical purposes. Bombay being a large emporium of drugs in the East, the varieties which came there would be of all kinds. The specimen shown was a very good sample, but he had seen Bombay linseed which contained more cruciferous seeds even than the Russian. With reference to Professor Redwood's remarks, no doubt the pure linseed cake could be got if a good price were paid ; but as a matter of fact, that used in feeding cattle was often exceedingly impure, as could be seen from reports in the *Live Stock Journal* and other papers, and he did not see how they were to ensure getting that cake only from which the best oil had been extracted, as Professor Redwood suggested. It seemed to him the best way for every pharmacist to get the best linseed he could, and grind it himself.

Mr. BOTTLE said he went a long way with Mr. Greenish in preferring crushed linseed to the old linseed meal, but he did not agree with him as to taking out 20 per cent. of the husk, as a large quantity of mucilage would thereby be lost. He was old enough to remember the time when there was no difficulty in getting pure linseed meal or pure linseed oil, even before the days of machinery for separating cruciferous seeds. The linseed was grown in good condition, and the oil was produced in fairly good condition ; then, unfortunately, the oil was wanted at a lower price, and adulterants were introduced into the seed, and the cake partook of the adulteration, and so a very imperfect material for a poultice resulted. He had for many years kept crushed linseed, and did not find it go bad. If the seed were in good condition when crushed, it kept very well, quite as well as the old dry powder. At the same time, if a good price were paid, he believed a cake could be procured which would yield pure linseed powder ; the only difficulty was in giving the price for it, and knowing you were dealing with respectable people. In Kent a great many farmers were in the habit of crushing their own linseed, because they could not buy cake which yielded satisfactory results ; and he got his crushed linseed from a large farmer, a friend of his, who had a crushing mill. He had inspected the seed, and found that no special process was adopted, or needed, for removing impurities. It certainly did not contain $2\frac{1}{2}$ per cent., or anything like that amount of impurity ; here and there you might find a cruciferous seed, which might be removed if necessary by the process that had been mentioned, and was now largely used for cleaning foreign wheats.

Mr. ATKINS said it was interesting to notice the progress which

had taken place in connection with this subject since Mr. Greenish read a paper upon it at the Edinburgh meeting thirteen years ago. In the benighted south they were not then so far advanced as in Glasgow, where Mr. Frazer, it appeared, had always been using crushed seed. At that date they were then largely using the powdered cake, though the meal with the oil in it was gradually coming into use, and in his own district it had now entirely superseded the dry meal. He understood that Professor Redwood rather favoured the plan of selecting pure cake, powdering it, and then adding oil; but the method put forward in the paper seemed to him preferable, of selecting a pure seed, crushing it, and retaining the oil. There might be care taken in selecting seed for crushing in London; but he should like to know if the same test were applied in Hull, which was one of the largest markets in the kingdom. No doubt linseed oil was an important article, but he doubted if the cake were not of quite equal importance in a commercial point of view.

Mr. CLARK said there was no difficulty in getting pure seed or pure meal, and as to cake, there had never been a time when such a large proportion of pure cake was sold. Many houses would send out a written guarantee with it, that it was pure, according to Dr. Voelcker's analysis. The facilities for cleaning seeds were now very great, and he had seen samples much better than the one Mr. Greenish had shown. The same thing applied to oil; there was no difficulty in getting pure linseed oil if you would pay for it, but if you only paid a second-class price, you could not expect a first-class article. He was told by varnish makers that there was not the same difficulty there was some years ago in obtaining genuine linseed oil. Wholesale dealers would supply crushed linseed from seed, a sample of which they would send, and guarantee it, and at such a price that he thought it useless for chemists to think of crushing it themselves. They used to do so, but they could now obtain it ready crushed more cheaply, and, he believed, equal in quality.

Mr. HASSELBY said he knew something of this matter, as he came from the neighbourhood of Hull. He had linseed in stock similar to sample No. 4, and found it did not keep well; it turned sour; the patients did not like it, and the medical men complained. At one time they used ordinary linseed meal and mixed oil with it, and during his apprenticeship it had a great sale; but it had now gone entirely out of use, because medical men had an idea that crushed linseed with the oil in it was the best, and they impressed

on their patients that they must get it. Pure crushed linseed could be bought by paying the price, but in many places chemists had to compete with grocers, who knew nothing about cruciferous seeds, and never cared to examine the quality of the linseed meal they sold. There was no doubt the linseed should be clean. One question was, where did all the English linseed go to? He thought it was largely used by the farmers and squires, who found that if their cattle had pure linseed cake they yielded more milk, and it was free from all unpleasant taste. He agreed with Professor Redwood that if you bought linseed cake which had already had the oil extracted from it, it had probably passed a certain standard, and must be, to a certain extent, pure; but then there was the difficulty that medical men now preferred the crushed linseed with the oil in. This point must, of course, be decided by the medical men themselves. Did it retain the heat longer, and was it more beneficial? He was inclined to think that the old lini farina did very well, and was as useful in the cure of boils and carbuncles as the modern crushed linseed; but there was another article which was now pushing it out of the market, powdered slippery elm bark, which, after a deal of hesitation, and after using crushed linseed in vain, he had himself found very efficacious in the cure of a carbuncle. There was a lot of whitish linseed in the market, which he should like to know more about; he fancied it was Persian.

Mr. HOLMES said it was Indian.

Mr. HASSELBY said he had lately had some of this light linseed, which his customers seemed to like better than the dark. Having inquired of a dealer if he could supply it, he said he thought he could, and he had a hundredweight to try; it looked very nice, but when he came to examine it he found a certain percentage of crushed horse-beans, the white flour of which made the sample look very nice. He thought it would be well if the students at the Square were more instructed in the use of the microscope for the detection of such adulterations, and that a few articles in the *Journal* on such matters would be of great advantage to the trade.

Mr. MARTINDALE said his father, who was a farmer, used to grow linseed, but he kept it for home use. He was under the impression that the large seed, which mostly came to Hull, was Russian seed, and it was very pure seed until the time of the Russian war, when, owing to the closing of the Russian ports, they had to look to India for it. The Indian seed, being very prolific, got mixed with cruciferous seeds, and hence it was not so pure as it used to be.

Mr. GREENISH said that was about the truth as regarded Russian

seed, but the seeds from Bombay and Sicily were, as a rule, very free from any weed seed.

Mr. MARTINDALE continued, that in most London hospitals the powdered cake was used, and in particular one of the surgeons of the Marylebone Dispensary, on the committee of which he was, insisted on his patients having the powdered cake, and would not have the crushed linseed. He generally supplied crushed linseed himself, because the public preferred it, but as to the comparative merits of the two, he was in some doubt. In his younger days nothing but the powdered cake was used; then one or two West-end chemists introduced the crushed linseed as a novelty, but he had his doubts as to its real superiority. In his opinion it was the mucilage and the hot application which was beneficial. He thought the demand of the farmers for cake was quite equal to that of the painters for the oil.

Mr. FARNWORTH (Blackburn) said he had had some experience in this substance, and he found the only satisfactory article was English or Irish linseed. With reference to the drying properties of linseed oil, he found from consulting oil merchants and manufacturers, that the Baltic seed made the best drying oil. In Liverpool, where Sicilian, Italian and Indian seed was much used, a much lighter coloured oil was produced, which could be used for grinding up with white lead, but it did not dry so well. The ground linseed he got was very satisfactory, and his customers liked it very well. It was English linseed crushed between stones, and much resembled Mr. Greenish's sample.

The PRESIDENT said this was a very interesting and practical subject, which always elicited a good deal of discussion. The old-fashioned way of testing linseed was to chew it: if it was gritty it had sand in it, and if it stung the tongue it had some other seeds mixed; but that was only a rough test which was not considered scientific enough for the present day.

Mr. GREENISH, in reply, said his main object had been to point out the necessity of including crushed linseed in the future Pharmacopœia. He thought the term *sem. lini contrita* would do for it very well, without reference to what it might have meant in the old Pharmacopœia. Professor Redwood had stated that it was very difficult to get a good linseed oil, on account of the presence of these cruciferous seed, and necessarily the same seeds must be found in the cake. He objected *in toto* to using cake, even when manufactured for the express purpose, in the formation of linseed meal; it was more consistent with pharmacy to have a linseed meal

made specially for the purpose. He had taken a casual sample, not picked, of Bombay linseed, to illustrate the very small amount of adulteration or admixture; there could not be more than 2 or 3 per cent. in it. On the other hand, he had specimens of linseed from northern climates which contained an enormous quantity of other seeds, and he thought the use in pharmacy of cake from which the oil had been pressed for other purposes was not worthy of pharmacists of the present day. There was much less difficulty in taking away small foreign seeds from the large Bombay linseed than from the smaller varieties. It also yielded a much larger quantity of farina in proportion than the small seeds from northern climates, which came from the Baltic ports. Mr. Borland had objected to 20 per cent. of husk being removed, but his idea was that so long as there was the amount of husk left which would give a gelatinous poultice, there was quite enough. A poultice made from such a material would remain the same size, and on the place where it was put, whereas without any husk at all it would run, almost like mustard. He had worked at this subject for a long time, and he could say from a very extended course of observation, that crushed linseed was remarkably free from any adulteration whatever. His opinion, which was in accordance with that expressed by Mr. Hanbury eleven years ago, was that this was the best article to keep, and the one which every chemist ought to keep, although he might also have the powder for those who wanted a linseed meal at a lower price.

In reply to a further question, Mr. Greenish said that he removed 20 per cent. of the husk because it made the crushed linseed look more like linseed meal, and did not at all interfere with the gelatinous character of the poultice.

The following papers were then read:—

STANDARDIZING OF PHARMACEUTICAL PREPARATIONS.

By G. F. SCHACHT, F.C.S.

The subject of standardizing our potent remedies has of late excited a good deal of attention in the pharmaceutical mind.

The idea contained within the words is excellent, for it must be admitted to be of the first importance that the physician should know exactly what he is administering to his patient, and at first

sight this great desideratum appears to be identified with the fact of "standardizing." But I have felt that, like many other doctrines of value, it is capable of erroneous application; and an attempt to estimate the subject fully, and especially in its relation to the obligations of pharmacy towards the art of medicine, has led me to certain conclusions that I should like to express.

It may be better perhaps that I state them at once.

The first is—that it is our duty as pharmacists to standardize with even severe accuracy all preparations that are of known definite composition—and these only. And the second is, that we should exert ourselves to extend this class of remedies to the utmost, and to eliminate, as far as possible, all whose composition is unknown or even uncertain.

These, I say, are my conclusions; but I beg to offer some of the considerations that have led me to form them.

I would in the first place observe that the subject is not, by any means, exclusively pharmaceutical; but much rather is it a medical subject with a pharmaceutical side.

If to medicine proper belongs the administration of materials as curative agents, and to pharmacy the preparation and supply of those materials—then, upon the professor of medicine will rest the obligation to investigate the various powers of those agents upon the human system, and the determination of their remedial values. Whilst the scientific record of their physical and chemical properties will naturally fall to the practical pharmacist.

Now the practice of medicine is not, at the present moment, founded upon altogether exact principles.

So, at least, the most illustrious among the profession tell us. We read so, and we hear so from every address delivered from high places. Much regret is generally expressed for the fact, much honour is lavished upon those individuals (always said to be few in number) who labour to exalt their profession to the dignity of a true science, and hopes are frequently indulged in that some day these efforts will be directed by authority and their results systematized and sanctioned in proportions to their apparent truth.

In the meantime, it is universally admitted that the practice of medicine is very largely empirical; nor is there the least taint of disrespect implied in the statement.

The enormous difficulties that attend the scientific analysis of the phenomena of disease and recovery are too apparent to need more than the hastiest reference; and though we may join in the hope that some at least of these difficulties will be overcome, we may be

quite certain that they cannot be easily removed, but must continue to exist for a long time to come.

And if, on the other hand, we have to express the opinion that the pharmaceutical portion of the art of medicine is definite, and that the demands made upon it by the other side have been fairly met, and its inquiries accurately answered, it must be admitted that this has been mainly due to the close alliance which pharmacy can claim with well-known systems of knowledge, and its problems being capable of elucidation under known lines of research.

The difference between two such questions as these—What organic principles can be educed from opium? and what are the effects of these singly and combined upon the human being in health and in disease?—appears to me simply immeasurable; indeed, not to be a difference of degree, but one of kind.

Therefore, I must be understood neither to criticise the shortcomings of the one, nor to raise the praises of the other, if I indicate—simply indicate—that the work to be done for the progress of medical science lies primarily, and almost exclusively, with the professor and practitioner of medicine; and that our portion of the work which is connected therewith, is already systematized, and is able to declare itself ready to be utilized in any further scientific inquiry that may be suggested; but that, for the present, we have fairly well answered all the demands of authorized medicine.

I will attempt to illustrate the meaning of these few paragraphs.

There are, as all here know, prescribers of very various kinds, and it is our duty and business to meet their wants, numerous though they be.

But especially would I remind you, on the one hand, of those whose prescriptions are more or less severe and simple—and on the other hand of those whose style is more or less, let us say, poetic and vague.

Both and all are indulged by pharmacy to their hearts' content.

The exact prescriber, who desires to mark the precise vital phenomena that attend the exhibition of an exact quantity of a special remedy—be it mineral or organic—can confidently rely upon pharmacy for the integrity of his experiment. Exact standard solutions of definite strength and of definite purity are at hand, and his dose can be apportioned to the nicest degree of accuracy.

Should his experiment, for instance, touch the subject of opiates, he can elect to prescribe the exact chemicals, morphia, codeia, etc., as he pleases, and in proportion as he desires exactness, exactness he can have. If he knows the remedial value of each of the

numerous principles contained in opium, and likes to prescribe definite quantities of every one of them in a single dose, he can do so, and pharmacy would be equal to the occasion.

But if, on the other hand, he prescribes the less exact extract of opium, or the still less exact crude drug, the inference is that, for the moment at any rate, he has parted with exactness, and prefers the dash of vagueness that his prescription indicates. In this case also, he can have his way, and pharmacy need not burden itself with vain regrets.

In prescribing opium, it is clear he did not want an exact dose of the chemical morphia—he preferred the indefinite mixture of things called opium; the responsibility of the pharmacist ceased with the correct dispensing of the prescription.

Medicine has for long demanded of pharmacy standardized morphia, and standardized dilutions of morphia and dilutions of other definite substances employed as remedies, and they have been instantly supplied. Bodies of this order lend themselves kindly to the minutest subdivision and very generally to the most exact verification.

But there is a class of pharmaceutical preparations very different from these. Oddly enough these have sometimes been called “simples,” though really amongst the most complex bodies in nature, and it is about these that the pharmaceutical mind has been of late so much exercised—I venture to think not always wisely exercised.

How often has philosophy experienced the futility of the attempt to define the undefinable! Let me take a less ambitious comparison. Because we have contrived an instrument we call a thermometer, shall we presume to measure the forces of the universe by the scales of Fahrenheit or Réaumur?

There are forces or modes of force in nature other than temperature; there are forces or modes of force in opium other than morphia, and in cinchona other than quinia, and in nux vomica than strychnia. How then can we scientifically measure them by any one fraction of their respective potencies?

The time may come when the readings of the thermometers may have much greater significance than they at present have. The time may come when the proportion of quinia in bark may tell the expert more than it now does; but much has to be done before these moments can be reached, and it would be wise not to anticipate them.

Would it not be wiser to turn to the natural processes by which

deficiencies of special knowledge are usually supplied, and if these can be seen to be in operation, rest content with the hope that results will follow in proportion to the effort made?

The natural process by which deficiencies in medical knowledge can be supplied appears to me to be—systematic medical research conducted under such authority as shall ensure the integrity of the investigation.

Pharmacy can assist in this inquiry, but it cannot conduct it. Its part in the work is important, but secondary. The initiation of every step rests with medicine proper, and we can do no more than assist with our science and our skill.

I think it might become the duty of organizations that represent pharmacy to offer co-operation at the right moment, but clearly that cannot be until some movement within the medical body indicates that organized work is about to commence. Individual research may be helped by individual assistance, as at present, but this will accomplish but little. The hope is that the profession of medicine as a whole will recognise more and more fully this great need of progress, and will set its heads and hands to range into scientific form the scattered fragments of its floating knowledge, and will authoritatively inaugurate a system of research that shall seek until it shall discover a firm basis for scientific medicine.

I am not sure that this is too much to hope for. Within the last few weeks I have received this pamphlet. It is entitled, "The Collective Investigation Record," and it informs me of a Committee being called into existence out of the British Medical Association, to institute some system of collective investigation into certain of the mysteries of disease, and that this Committee has already commenced its labours. It contains some names most honourably illustrious in the profession, and I am glad to see among the sets of subjects announced as included in their programme, "the collection of evidence as to the effects of certain remedies."

I have heard also that there is some probability of a chair being created in the University of Cambridge, the chief work in connection with which is to be the study of the operation of medicines in disease. These look like signs of the systematic inquiry to which I have alluded; and if it were possible for one or other of our pharmaceutical organizations to offer co-operation with either of these agencies, I think it might be well.

In the meantime, let us pretend to nothing that we do not know, lest we mislead. We know for certain that all the medical potency of dilute hydrocyanic acid must depend upon the hydrocyanic acid

that it contains; and let us be scrupulously careful to "standardize" our solutions to the authorized strength. But as we know but little of the medical potency of many of the principles that together constitute most of our galenical remedies, let us forbear to assign them a quasi-potency which a fuller knowledge may show to be erroneous.

To repeat my conclusions, then, in a practical form: I think that bodies of definite chemical composition and their dilutions are eligible for standardizing; but preparations of the nature of vegetable infusions, tinctures, extracts, being for the most part mixtures of indefinite and unknown agencies, cannot be standardized without risk of misleading.

Whenever any one of this latter class of bodies has been so studied that the remedial potencies and chemical properties of all its elements are declared [by authority to be well known, that one passes from the latter class into the former.

STANDARDIZED PHARMACEUTICAL PREPARATIONS.

By D. B. DOTT, F.R.S.E.

The subject of standardized preparations is one which has occupied a good deal of attention within recent years, and their introduction into the Pharmacoposia has been ably advocated at more than one meeting of the Pharmaceutical Society. It is not surprising that this opinion should be widely maintained after what has been brought to light regarding the variation in strength of some of the most powerful preparations of pharmacy as these are found in the market. All will agree that such preparations should be unvarying in their activity; so that at first sight it would seem that a system of standardizing is most desirable, and the best way of overcoming all difficulties. It is, however, because I believe that the introduction of such a system as that referred to would be essentially a mistake, that I have been led to lay before you these few remarks, in which I shall endeavour to establish the provision I maintain.

In the first place it is to be observed that in order to standardize preparations of a drug it is necessary that the amount of active principle or principles be capable of accurate and reasonably easy determination. This rule excludes from our consideration a large section of the *materia medica*, as there is a host of drugs whose active principles are unknown or incapable of exact determination.

Speaking generally, indeed, it is only practicable to standardize preparations of those drugs which readily yield their active principles in a state of comparative purity. This immediately suggests the question, Why not in all cases employ solutions of the active principles in place of the old galenical preparations? I am convinced that this is the true solution of the problem as to how inconstancy of composition is to be avoided. No doubt we shall be told that many medical men believe the tinctures and the like to be more efficacious than solutions of their active principles, and there is undoubtedly an opinion of that kind more or less prevalent, which must be respected, although it is held chiefly by the rank and file, and not, so far as I am aware, by any of the leading therapeutists. It seems incredible that a mixture of principles, sometimes antagonistic, often dissimilar, in their mode of action, should be preferable to the principles, pure and simple, or to a combination of them to suit a particular case. To use the words of a distinguished professor, "Pure alkaloids of definite composition, and therefore of unvarying action, are what the therapist requires, and the chemist who can furnish him with these, and by the readiest and cheapest methods, benefits both therapeutics and pharmacy as much as he who brings to light a new alkaloid."*

True, it may be said, but so long as there is a demand for these galenical preparations by the profession and the public, pharmacists must produce and supply them, and to ensure their being of proper strength, they must be standardized. Without doubt, so long as the Medical Council inserts in the Pharmacopœia a tincture of opium as well as a solution of morphia, and a tincture of nuxvomica as well as a solution of strychnia, these tinctures must be prepared, but it remains to be proved that they ought to be standardized. In nearly all cases, if a drug is of proper quality, all the preparations made from it will likewise be of the right strength. That is to say, if opium (for instance) of the B. P. standard, be used for the production of the tincture or any other preparation which is made up to a given bulk, there can scarcely be any error in the result. Of course the rule is of universal application, that the material operated upon be of sufficient purity, and that the extraction be carefully performed. It is said, however, that in the case of solid extracts there is a source of error, because the amount of extractive matter varies, and that not in direct proportion to the amount of active principle. I believe this is quite an exceptional

* *Pharm. Journ.* [3], xiii. 762.

condition of things, but it is true to some slight extent of opium, and apparently to a more serious extent of *nux vomica*. To some minds this may suggest the necessity of standardizing these particular preparations, but to me it rather appears a reason for their disuse. In any case, the question is reduced to somewhat narrow limits. I would now refer to an objection to standardizing pharmaceutical preparations which I have never seen noted, but which ought to be emphasised; that is, that the operation could only be safely performed with an amount of knowledge and experience which would not be always available. A serious error in analysis might lead to greater variations in strength than the pre-standardizers ever dreamt of.

There is another aspect of the question which must be referred to. An opinion seems to have been formed in some quarters that a standardized preparation is one which has undergone a process of purification or alteration. Quite recently there appeared in the leading medical journal an elaborate article on standardized laudanum, but the result there described is evidently not laudanum, but an impure solution of morphia salts.

Taking all the facts into consideration, I think we ought to be led to the conclusion that no general system of standardizing ought to be introduced into the British Pharmacopœia.

A vote of thanks having been passed to the authors of these papers,

Professor REDWOOD said he had listened with considerable interest to these communications, and he was prepared to go a considerable way with Mr. Schacht, at any rate to the effect that it was important in the interest of medicine that preparations of a definite composition should be used as far as possible, and that such preparations should be standardized, yet he was anxious to show that they were called upon to go farther than Mr. Schacht seemed prepared to go at present. Mr. Schacht had laid down too, what must be admitted, that the practice of medicine was, to a great extent, empirical; and while nine-tenths, or at any rate a large proportion of the medicines employed for the relief of disease, were preparations the exact compositions of which were unknown, and which they had not the means of becoming acquainted with, there seemed to be an idea shadowed forth that all such substances of unknown composition should be excluded from the practice of medicine, and if that were so, all he could say was that the practice

of medicine being at present mainly founded on experience, for there was nothing yet very substantial to depend upon with reference to therapeutics beyond the observations made by medical men, who employed various agents in the treatment of disease, and were not yet able to determine entirely the mode of action of the remedies which were employed, it mattered not much whether the substances which were found to produce certain effects were of a perfectly definite and known composition or not. Of course it was clear that advantage would result, and that, in fact, every advance in medical practice must be founded upon the substances used in any particular case being, as far as possible, identical with those which had been successfully used in similar cases before; that was a mode of reasoning which must be applicable to indefinite as well as definite medicines. As he understood, what was contended for in connection with the standardizing of pharmaceutical preparations was that there should, as far as practicable, be methods by which their identity of properties could be insured; that in point of fact, medicines, whether galenical or chemical, should be subjected to certain means of examination by which it could be ascertained that they coincided, in certain properties, with the medicines intended to be used. There were many potent medicines, the efficacy of which was attributed to certain chemical principles, which were definite and known, and which were of the nature of those Mr. Schacht had especially referred to as being those which he would advocate the standardizing of. But with reference to many of those medicines, the effects which had been produced by the active principles in a separate state did not at all come up to the effects produced by the preparations which contained those active principles associated with others. He saw no reason why the preparations of such articles as opium, cinchona bark, and other substances which contained definite active principles, should not be, as far as possible, regulated so that the proportion of active constituents should be adjusted, leaving others which were less active undetermined. It must be admitted that this was a defective method of carrying out the object, but it was much better to carry it out as far as practicable than to reject it altogether. Taking for instance preparations of cinchona bark, which he had been actively working upon for some time; it had been shown that medical men and pharmacists had for a long time been using such preparations under the idea that they contained a certain proportion of the active principles, but they had been subsequently convinced that they were very deficient in those respects, and he saw no reason why,

because they could not standardize every constituent in such a preparation, they should neglect to accomplish the object as far as possible. He was almost prepared to think at one time that Mr. Schacht's design in objecting to standardizing galenical preparations was that they should be discredited in the estimation of medical men, who should be driven to use only such medicines as were of a definite and known composition. He might be mistaken in this view, for certainly if it were contemplated he did not think it one which it was at all desirable to promote. Medical knowledge had not yet advanced to that position that even with regard to agents of known composition they were altogether acquainted with the *modus operandi* so as to make therapeutics anything like a scientific subject.

Mr. PLOWMAN reminded the Conference that there were three papers now before them for discussion; first, that of Messrs. Dunstan and Short, who unhesitatingly recommended standardizing the preparations of *nux vomica*, and the two papers just read. Mr. Schacht did not advise the standardizing of any preparation other than those of a perfectly definite character, and Mr. Dott went on much the same lines. He was inclined to agree in the main with these two gentlemen. For instance, opium was largely used for diabetes, and the constituent which was said to be active in that case was codeia, and now codeia was extensively prescribed for that disease. What could be more absurd than to standardize opium for its strength in morphia, and then give it for diabetes? On the other hand, there were bodies, not so complex, which had been pretty fairly exhausted so far as their active ingredients were concerned, and in which the physiological action of the constituents had been found to vary in no respect from the physiological action of the whole drug. In these cases the constituents might be taken as a basis, and the article standardized with confidence. He thought that *nux vomica* might be one of these; it contained strychnia, brucia, igasuria and igasuric acid. Now brucia was one of those things which had not yet been worked out, but so far as the evidence went, its action did not differ largely from strychnia, and *nux vomica* seemed to be one of those drugs where standardization might apply. There was no doubt that medicine was largely empirical, but a distinction between physiological action and therapeutic value must be drawn. There were many drugs the physiological action of which was not known, and from their nature never could be known, but the therapeutical value of which was indubitable, and it was quite hopeless to attempt any standardizing of

these. He could not agree with one statement in Mr. Dott's paper, viz., that the idea that tinctures were more efficacious than the isolated principles was not held by leading therapeutists. He was brought in contact with some very distinguished therapeutists, and they certainly did think that many drugs, notably opium, had remedial effects which could not be obtained by any admixture of alkaloids.

Mr. HASSELEY suggested that medicine was largely empirical, partly because the same article in medicine was not always produced. It would be very useful if opium and certain other powerful remedies were standardized, especially to a man taking over a new business and stock. It would be a very great benefit to chemists in examining their own articles if there were a process for standardizing the tinctures of aconite, belladonna, and other preparations of that powerful class. In the race of competition now-a-days, there was a powerful pressure upon wholesale houses, and no doubt, as was shown by the changes in the constitution of some of these old firms, and by the admission of young men of ability, they were aiming at a high standard of purity and strength, so that customers might depend on everything they sent out; but there were other wholesale houses which could not be so thoroughly depended on, and therefore chemists ought to be in a position to judge for themselves. He was once waited upon by a partner in a wholesale house, and asked if he would buy some camomiles; they were rather discoloured, and he declined to take them. The wholesale dealer said he had no patience with chemists, he could find no one to buy these camomiles, and that he should take them home and turn them into extract, which no doubt he did, and sold it throughout the country. He sincerely hoped that some of the abler chemists would take up the subject of standardizing these tinctures and preparations for the benefit of those who were not quite so learned in the matter.

The PRESIDENT said there was one consideration put forward in these papers, which was very difficult to answer, namely, that medicine was empirical; it was experience which had guided medical men, not their theoretical knowledge of the powers of things which they had administered as medicines. For instance, to take such an article as bismuth, who could by any *a priori* reasoning have arrived at the conclusion that the preparations of that metal would prove useful in the many diseases for which bismuth was now found so valuable? That was an instance of the difficulty of treating medicinal agents in a manner as scientific as they all might

think desirable. Medical men were therefore obliged sometimes to accept a drug which was not quite understood as far as its action on the system went, but to be guided by experience as to its medicinal properties, rather than throw it over because the reason it possessed those properties was not understood.

Mr. MARTINDALE said he wished to say in reply to Mr. Schacht that, although with regard to preparations they could not all be standardized, when you came to such crude products as opium, barks, and nux vomica, which came into the market perfectly valueless for alkaloid manufacture, there ought to be some system by which they could be examined and pronounced to be unfit to be used in medicine. But when you came to other preparations it must be remembered that the standardizing of them would entail a very great deal of labour, and the question was, How were pharmacists to be repaid? He feared the tendency would be to throw a great deal of the trade into the hands of the wholesale manufacturer. In such cases competition would come in, and in the case of opium, for instance, the preparations might be standardized by the proportion of morphia with the omission of codeia altogether. The same with regard to tinctures of bark. The compound tincture might be made containing so much cinchonine, and it would only be worked up to a certain strength in that constituent, which was supposed to be the active principle in pale bark. His view was that they should exclude bad drugs from being employed by Pharmacopœia tests, rather than standardize the preparations in the Pharmacopœia.

Mr. GERRARD, whilst in favour of standardizing where it could be properly applied, saw a great many obstacles in the way of the process being carried out to any great extent. There were but very few drugs in the Pharmacopœia which admitted of it with any degree of accuracy. Scammony might be standardized for resin, and perhaps elaterium for elaterine, and perhaps belladonna for atropine, or the mixed alkaloids, considering that the alkaloids were all of the same molecular weight; but with reference to nux vomica, he felt a certain amount of doubt, as the principal alkaloids, strychnia and brucia, were not always present in uniform proportion. Again, the alkaloids of opium and of cinchona barks admitted of a certain degree of standardizing, as mentioned by Mr. Martindale, where the total percentage of alkaloid could be mentioned with special reference to morphia in the one and quinia in the other. But how was it proposed to deal with the question of maintaining these galenical preparations to the standards when they were

prepared, because most were subject to change? The tincture of to-day was not the same as it was twelve months ago. No doubt the active principles were involved in changes, and became to some extent destroyed, and he did not see how this difficulty was to be met. He was inclined to think that the subject would have to be entered into far more fully and carefully than it had been as yet.

Mr. SCHACHT was glad to find the difference between Professor Redwood and himself was one after all simply of degree. He was quite content to leave it to the practical wisdom of his fellow pharmacists, of whose views he hoped the Professor was a fair exponent. Professor Redwood agreed in thinking that certain things should be standardized, but wished him to go a little further than the limit he had laid down. Of course that was simply a practical question, and at the end of his paper he ventured to say that as far as knowledge was obtained with reference to any complex body, more especially therapeutic and physiological knowledge, to the extent of enabling them to determine the therapeutic value of every ingredient in it, then it became a standardizable article. Mr. Plowman seemed to be of opinion that *nux vomica* was such a body, that they knew enough of it chemically, and that enough was known of it medically to enable some authority to declare how preparations of *nux vomica* should be standardized. To that very case he took exception, and had done so before on these grounds. They knew a great deal about strychnia, but his impression was that brucia had never been experimented upon, for the simple reason that it had never been obtained pure; commercially it certainly had not, and he thought it very doubtful whether it had ever been seen by the men of science in a perfectly pure state. He was quite convinced, therefore, that there had been but a very imperfect knowledge obtained of its therapeutic value. Now, to go a little further, had the matter been studied in its relation to the effect one element might have on the other, given simultaneously as they would be given in the case of prescribing preparations of *nux vomica*? It certainly had not, and, therefore, there were no means of enabling the real value of the preparation to be ascertained by any process at present known. The relation between these two potent ingredients was not yet ascertained; they did not know in two separate samples of *nux vomica* what the proportion between the two alkaloids would be, but all experience showed that they would be different. So, therefore, to standardize an article which resulted from the manipulation of *nux vomica* by the amount of one of its ingredients seemed to him distinctly unscientific. On that

ground it was he was opposed to the idea of standardizing galenical preparations. Professor Redwood seemed to think they were called upon to go further in this process of standardizing. But by whom were they called upon? The medical profession could not do so; they had no right to do so; they had not done their part of the work; they had no right to ask pharmacy to go ahead of medicine. If medical men wanted strychnia, and very likely if they wanted brucia, they could have it; if they wanted anything, they could have it; but they must make the first move themselves towards exact remedies. It was not for pharmacists to supply them with standardized products before they were wanted. A mere standardizing of a preparation by the amount of one or more of the alkaloids it contained would be misleading. It was giving an adventitious value to the preparation, which it did not necessarily possess, and was thus worse than unscientific. He did not blame the medical profession for being empirical; they were and must be empirical in the treatment of disease. They did not know the specific operations of the essential principles of opium; they gave the opium, because they knew that on many occasions opium did good, not because they knew the operation of each ingredient. That was the difference between empiricism and exact science. Why should pharmacists be so wonderfully anxious to supply a blank in medical science, when they were not asked to do so? Medical men prescribed extract of opium; if they wanted morphia or codeia, let them prescribe it. At the same time he did not want to drive the profession to using nothing but exact remedies, but he wanted as much knowledge as possible to be gained about everything, and if medical men and pharmacists together could find out all about opium, let them use their knowledge by all means, for then it would be an exact remedy; but until that time arrived he objected to attempting the impossible.

Mr. PLOWMAN added in explanation that he intended to refer before to some things which should be standardized, and some which should not, and he thought nux vomica might perhaps be standardized. He meant to imply that it was about on the border line.

Mr. DOTT said his position was simply this: he could not understand how one could standardize a galenical preparation by estimating the amount of alkaloid it contained, if the activity were not due to that alkaloid. The very fact of adopting that as a means of standardizing was a tacit admission that the activity was due to the alkaloid. Some misunderstanding had arisen from using the

word standardizing. Every one would admit that drugs ought to be up to a certain standard of purity and genuineness. What he said was solely with reference to preparing tinctures or other preparations stronger than they ought to be, and then after finding the amount of alkaloid or other constituents in the tincture, diluting to the required extent. With regard to medical opinion as to the value of tincture of opium and other preparations of opium compared to the alkaloids themselves, generally speaking, medical opinion on those points was probably wrong. The medical profession was the most prejudiced of all professions, and he could point out hundreds of instances in which ideas once firmly held had been exploded; for instance, with regard to the use of chloroform prepared from methylated alcohol and from pure alcohol, and other things of that kind. One instance was the popular belief, which was held by many medical men, that tincture of opium was valuable in diarrhoea, but morphia solution was not, whereas it was perfectly well known to others that solution of morphia was just as efficacious.

The Conference then adjourned.

Wednesday, August 13th, 1884.

The chair was taken at half-past ten by the President.

The first paper read was on—

A FOSSIL ALOE FROM THE WEALDEN.

By G. A. KEYWORTH, F.C.S.

When moving among the shingle which lies beneath the cliffs of Hastings, we may sometimes observe certain curious stony masses of paler or darker shades of brown, rounded by the roll of the waves and perforated with numerous longitudinal furrows which are studded with minute glittering crystals. At first sight these furrows might suggest the boring action of a teredo upon some pieces of floating timber, but these masses are in reality portions of the stem of a fossil plant belonging to the endogenous or monocotyledonous order, having leaves with parallel veins. This great division of the vegetable kingdom, represented in the temperate zone by grasses and herbaceous plants, rises as we approach the tropics to the lofty palm, the bamboo, and the aloe, including numerous trees of extreme usefulness. One of the stony masses

before you has upon its surface portions of the original bark changed into a brittle jet. It was taken thus out of the sandstone cliff, and fortunately preserved by the workmen. These stony masses consist of silica or flint with a trace of iron, and are almost entirely soluble in hydrofluoric acid. Under the microscope the whole is seen to consist of small crystals of quartz six-sided prisms with six-sided pyramids at both ends. (I have repeated an experiment made by Professor Göppert, of Breslau, in imitation of the natural process of petrification or fossilization, by steeping a slice of pine wood in solution of ferric sulphate, drying it, and then burning off the carbon. The ferruginous residue shows the ligneous structure.) This fossil has long been known as the *Endogenites Erosa*, a name invented probably by Dr. Mantell, a geologist of great eminence, who devoted himself to the geology of the south-eastern portion of England. The name was well chosen, as referring merely to the eroded endogenous cells which are so conspicuous. Some have thought that these fossils belonged to the palms, or to a gigantic rush, or to the cactus, or, with Mr. Dixon, a distinguished Sussex geologist, to the tree ferns. Mr. S. H. Beccles, F.R.S., an eminent local geologist and *savant*, was fortunate enough to find a fossil leaf "*in situ*" with a portion of the stem, near the White Rock at Hastings. The leaf is lanceolate, and resembles that of the aloe, and he considers that the great American aloe is the nearest living representative of this ancient fossil. When, we may ask, did these fossil stems bend before the sultry breeze, and when did the sap fill these furrows? The answer to these inquiries will take us back into the remote past, towards the earlier conditions of that globe on which we live. The generosity of Sir Thomas Brassey has adorned our Town Hall with an exquisite piece of sculpture, representing Edith, the betrothed of Harold, finding his dead body upon the battle field, after that memorable conflict which crowned the Norman arms with victory. At a distance of some eight centuries, crowded with human history, this great event seems to us very remote, yet what a mere span when compared with the vast periods during which the material itself of this work of art was being formed. The slow deposition of chalk in sea water, its consolidation and upheaval, and conversion into statuary marble by the heat of intruded igneous rocks. The fossil before us was a living tree, flourishing with grace and beauty in this very neighbourhood, at a period long previous to the chalk era, under conditions known as those of the Wealden, so called because first studied in the south-eastern portion of England,

called the Weald from its ancient forests. The Wealden was a fresh-water formation (shown in this map) deposited in the delta of one or more large rivers, flowing from the north-west, entering the lagoon near the site of Oxford and extending to Central France, the whole area being some twenty thousand square miles. It was laid upon a previous Oolitic floor, produced, together with other secondary formations, after the close of the Coal period. The Australian Continent presents now an area analogous to what this Oolitic floor was before the Wealden lake commenced, its kangaroos being representative survivals of the mammalian life of that period. Portions of the sandy shoals of the Wealden lagoon were occasionally left dry, and show us now ripple marks from ancient currents, and sometimes the footprints of air-breathing animals of the strange amphibious unwieldy forms pictured on these sheets, and restored with great skill at the Crystal Palace lake. The *Iguanodon*, *Hylæosaurus* and *Megalosaurus*, gigantic lizards. The *Pterodactyl*, a flying lizard, was a Saurian reptile with the bones of the forearm and hand singularly elongated like those of the bat, while light and hollow as in the bird, thus giving the power of rapid flight and probably of swimming. Remains of some have been found in the Kentish Chalk as large as the albatross, with wings fifteen or eighteen feet in expanse. The skilled comparative anatomist can sometimes from a single new bone describe the animal to which it must have belonged. A remarkable instance of this profound knowledge was shown by Cuvier, to whom Dr. Mantell submitted some strange fossil teeth found by his wife on a roadside stone heap near Cuckfield, in 1822. Cuvier pronounced them to be teeth of a new animal, a large herbivorous reptile (the *Iguanodon*), an opinion confirmed by subsequent discoveries. Dr. Mantell then visited the museum of the Royal College of Surgeons, and, assisted by Mr. Clift, found a close resemblance in the teeth of the modern *Iguana* of tropical America and the West Indies.

The fishes were chiefly of the Ganoid and Placoid orders. A portion of one of these, the *Lepidotus Mantelli*, with its enamelled scales, is before you. It was allied to the Gar-pike of the American rivers. The whole body was covered with large thick rhomboidal scales, coated on the exposed side with enamel. These fishes lived either in the lagoons of this great delta or at the mouth of the estuaries entering the sea. The trees of this region, growing upon the drier portions of the surface, consisted of various Pines, Cycads, Ferns, with Palms, and, as we see, the Aloe. The climate was sub-

tropical. We must imagine a large area of sandy shoals and damp meadows, resembling probably the existing delta of the African Niger, which stretches into the interior for more than one hundred and seventy miles, and covers some three hundred miles along the coast. The sand thus carried by currents age after age slowly accumulated, together with mud; and thus, aided by a sinking process, the Hastings sand formation was deposited, together with other formations of sand and clay, the thickness of the whole Wealden series being estimated by Lyell at two thousand feet. Great changes then followed. The Wealden formation descended beneath the ocean, and upon it commenced the slow deposit of that chalk which we see at Dover, Folkestone, and Beachy Head. When in the course of an enormous period this chalk had been deposited, it was slowly upheaved to form the vast ridge of the North and South Downs. A scalping and sculpturing process now set in, effected by the agency of ice and streams of water, and laying bare the Hastings sandstone formation. How difficult to realize all this, and how strange to reflect on the long imprisonment of these fossils, their burial dating countless ages fast locked in the sand-rock whose crown was now an ocean floor rearing a mighty burden of chalk, the uprising of the whole of which is seen in the bent and distorted Hastings sand strata!

The denudation referred to removed the chalk from the wide area of Pevensey Level, the Hastings coast, the Pett Level by Rye to Folkestone, and far inland behind, extending westwards into Hampshire. At Tunbridge Wells a hard bed of white sand occurs, belonging to the Wealden formation, which occasions the picturesque scenery of the High Rocks and other resorts. To the sandrock Hastings is indebted for much of the charms of its scenery. The warm tints of paler or darker brown, often seen in relief against a sapphire sky, give effects of light and shade which attract the pencil of the artist: the hills and valleys with rounded outlines clothed with verdure give variety to the Sussex landscape. The Castle Hill at Hastings consists chiefly of what is known as Ashdown sand, surrounded by some Wadhurst clay on the north. The sand has been excavated for some hundreds of yards in the windings of the St. Clement's Caves. The East Cliff, with its fine outline, is composed in the same manner. The Lovers' Seat is placed in a nook of the Ashdown sand overlying Fairlight clay. The beautiful glens of Ecclesbourne, Covehurst, and Fairlight, have been carved by running water out of the same materials. The Dripping Well gives its little stream over a ledge formed by

K K

hardened beds of Ashdown sand; and Old Roar, to the north of Hastings, said to have formerly had a fall of forty feet, trickles over a similar ledge of hardened sandrock in the Wadhurst clay.

At Bovey Tracey, near to Newton Abbott, in Devonshire, surrounded by the granite and other rocks of Dartmoor, is a barren tract of land which is an ancient fossil lake bed as it existed after the chalk period. It is remarkable as being the only instance of the kind known in Great Britain. A lake of the size of Windermere existed there, fed by streams from Dartmoor, carrying down the finely ground granite and vegetable matter, and forming now a bed of fine clay, used with great success there in the manufacture of pottery. The lignite or imperfect coal into which the vegetable matter was converted, contains iron pyrites, and emits, consequently, a sulphurous odour on burning, but it has been applied to the baking of the pottery. The lake was surrounded by willows and the dwarf birch, together with many coniferous trees of the Californian *Wellingtonia* type, also ferns, vines, figs, dates, and lanrels, with water lilies. The cinnamon and palm also grew there. It has been inferred that, on the whole, a sub-tropical climate then prevailed in Devonshire.

Previous to the year 1872 nothing was known of the strata lying beneath the Wealden centre. In anticipation of the visit of the British Association to Brighton, Mr. Henry Willett then suggested the celebrated subwealden boring, with the twofold object of ascertaining the nature and thickness of the underlying strata, and also whether coal strata, as in Belgium and the Boulonnais district in France, extend across the Channel in this direction. Any additions to our coal seams are of grave importance when we remember that our national prosperity is largely dependent upon cheap and abundant coal, the consumption of which is steadily increasing by land and sea with the extension of steam power. Subscriptions came rapidly in, and the boring was commenced in August, 1872, on the estate of Mr. J. C. Mappin, at Netherfield, near Battle, by Mr. J. A. Bosworth, who attained a depth of three hundred and twelve feet. At the close of the following year the work was transferred to the Diamond Rock Boring Company, and carried seven hundred and six feet further. An accident to the rods now involved a new bore hole, which was commenced in February, 1875, and was extended to a depth of one thousand nine hundred and five feet, when another accident occurred, and the work was abandoned. The second hole had at first a diameter of eight inches, from which a solid core of rock seven inches in

diameter was extracted. The size of the hole was lessened as often as it became necessary to line it, until at last the diameter was only two inches, yielding a one-inch core. The boring first passed through clay and shales, and at one hundred and twenty-five feet a bed of gypsum was reached forty-three feet thick. The rest of the strata consisted chiefly of sandstones and shales. Mr. J. E. H. Peyton, F.G.S., of St. Leonards, gave much assistance in examining the cores from the drill and collecting the fossils. Some important additions to geological science were made by this boring, and Sussex was raised to a place in the "Mineral Statistics," a shaft having been sunk near for the purpose of extracting the gypsum, and from this "Subwealden Mine" two hundred and thirty-four tons of gypsum, valued at £70, were raised in 1876. The mine is now worked with success on an extensive scale, the gypsum being of superior quality. This is the only mine of any kind in Sussex, where, three centuries since, the woods resounded with the clang of heavy hammers and the roar of furnaces, whose glow was conspicuous by night. The manufacture of iron from the ferruginous sands and clays of the Wealden, commenced by the Romans, was at this period the most important in Great Britain.

The PRESIDENT proposed a vote of thanks to Mr. Keyworth for this very interesting paper on the fossil aloe. The geological subject was hardly within the usual range of the Conference, but as this paper came from a gentleman so well known as a local authority, and who had given such an interesting account of the geology of the locality, they were much obliged to him.

Mr. BORLAND said as this paper contained a considerable amount of information about the Wealden formation, it was interesting to those who came from a part of the kingdom which was very much below the Wealden. But to return to questions more connected with the Conference, he would ask Mr. Keyworth what were the grounds upon which this fossil was considered to be an aloe. He stated that the leaf was lanceolate. He had always understood that the aloes had a broadly subulate leaf, not lanceolate, and, therefore, if this were really a lanceolate leaf, he could scarcely consider it as belonging to the aloe tribe. He should like to have a description of the transverse section of the fossil, and then of the leaf, and they would then be in a position to judge whether there was sufficient evidence for placing it in the list of aloes. Then he should also like to know, if it really was an aloe, whether there was any reason to

suppose that the graminivorous creatures of the period used it for therapeutical purposes.

Mr. HOLMES remarked that Mr. Keyworth mentioned the fossil aloe as being the nearest representative of the great American aloe. The name "American aloe" being commonly applied to a plant of a different natural order, viz., *Agave americana*, it was desirable to know whether Mr. Keyworth intended this plant or the *Aloe vulgaris* by the term "great American aloe." Mr. Keyworth had mentioned the occurrence of a jet-like substance in the bark of the aloe; this would seem to indicate more relationship with the genus *Dracaena*, several of the plants of this genus yielding resins. When at Whitby a short time ago, he had noticed pieces of jet in a fossil trunk protruding from a boulder, which seemed to indicate that jet was of the nature of a fossilized resin.

Mr. KEYWORTH, in reply, said he must apologise for bringing forward a paper which was not strictly pharmaceutical. For a long time he thought, with Mr. Dixon, that it was a palm or tree fern; but then he fell in with Mr. Beccles, who at once said it was an aloe, because he found a leaf *in situ* which belonged to the aloe. He told him that he was perfectly familiar with the American aloe, and he had one in his possession at one time of very great size, so that he knew the leaf perfectly well. One gentleman had found fault with the word "lanceolate" as applied to the leaf, but having investigated several authorities, he came to the conclusion that on the whole that was the right word. No doubt most people applied the word aloe to another plant—the Adam's needle, or yucca, which had a sharp-pointed leaf, more like a lance. He much regretted that he had not been able to bring the leaf, but he had little doubt on the subject, because Mr. Beccles was really a thoroughly scientific man, and well versed in the subject.

The next paper read was—

ON HYMENODICTYONINE, AN ALKALOID FROM
HYMENODICTYON EXCELSUM.

BY W. A. H. NAYLOR, F.C.S.

A year ago I had the honour of submitting to the members of the British Pharmaceutical Conference "Additional Notes on the Bitter Principle of *Hymenodictyon Excelsum*."* The paper contained an

* *Pharm. Journ.* [3], xiv. 311; *Year-Book*, 1888, p. 492.

account of the methods by which the alkaloid could be extracted from the bark, its physical characters and more important properties, and an intimation of its empirical formula, concluding with a description and the centesimal composition of a neutral body which had been isolated during the process of extraction.

In continuing the investigation the experiments have been directed towards determining the molecular weight of the alkaloid, and the present communication is intended to supply data from which the rational formula of the body may be adduced. Its basicity in the first instance was sought to be ascertained from an examination of the compound produced by its combination with monobasic mineral acids. These salts were prepared from the surplus stock that supplied the material from which on combustion the empirical formula referred to was deduced. As the results obtained exhibited impossible relations in the ratios between the base and the respective acids, it was decided to conduct the operations involved in the preparation, purification, and desiccation of the alkaloid, under improved conditions.

A fresh supply was procured by exhausting with chloroform a mixture of lime and bark air-dried, and withdrawing the base from solution by agitation with weak sulphuric acid. From the acid solution it was separated by caustic soda. It was thoroughly washed with cold water and taken up by ether; evaporation and resolution in the solvent twice repeated sufficed to yield it in a state of purity.

Special attention is here directed to the circumstance that the process of evaporation—aqueous, alcoholic, ethereal—throughout this investigation was carried on in vacuo.

The same statement applies to the drying of the various products, unless otherwise specified.

The base when purified from ether corresponded to the description of the alkaloid previously given, and confirmed its behaviour towards reagents. An additional observation of considerable interest has to be recorded, viz., that by an extremely slow evaporation of its ethereal solution it assumed a distinctly crystalline form. Practical effect may be given to the condition by putting a little of the ethereal solution in a test tube and stoppering it with a cork through which a pin-hole has been drilled. After the lapse of a fortnight the residue when examined microscopically will reveal an abundance of well-developed acicular crystals. A new and striking reaction of the base with sulphuric acid was also noted. When placed in contact with this acid, the solution by transmitted light assumed a lemon yellow colour, passing to a wine-red and ultimately a deep claret;

by reflected light it presented a bronze appearance. The fluorescence was accompanied by the disengagement of sulphurous acid. On combustion the purified and dried alkaloid gave the following numbers:—362 gram of substance burnt with oxide of copper in a current of oxygen gave 1.05 gram of carbonic acid and .365 gram of water equivalent to—

Carbon	79.10 per cent.
Hydrogen	11.20 „

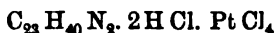
The nitrogen determination was vitiated by the accidental introduction of a little air towards the end of the operation. Subsequent results showed an error of nearly half per cent. in excess of theory.

Platinum Salt.—This salt was precipitated as a yellow amorphous powder from a neutral or feebly hydrochloric acid solution in alcohol on the addition of an alcoholic solution of perchloride of platinum. It was not appreciably soluble in cold alcohol, and refused all attempts which were made to induce crystallization.

Analysis furnished the following numbers:—

1. .499 grm. of substance gave on combustion .6705 grm. of carbonic acid and .2461 grm. of water.
2. .411 grm. of substance gave on combustion .5467 grm. of carbonic acid and .1997 grm. of water.
3. .350 grm. of substance gave on ignition .092 grm. of platinum.
4. .3725 grm. of substance, dried at 100° C., gave on ignition .0965 grm. of platinum.
5. .244 grm. of substance gave on ignition of corresponding ammonia compound .063 grm. of platinum.
6. .200 grm. of substance gave on ignition .518 grm. of platinum.

These numbers assign to the platinum salt the formula,—



The theoretical values of which are placed beneath the experimental percentages.

	1.	2.	3.	4.	5.	6.
Carbon .	36.64	36.27	—	—	—	—
Hydrogen .	5.50	5.39	—	—	—	—
Platinum :	—	—	26.28	25.90	25.82	25.90
$\text{C}_{23} = 276$			36.48			
$\text{H}_{40} = 42$			5.28			
$\text{N}_3 = 28$			3.70			
$\text{Pt} = 197.4$			26.09			
$\text{Cl}_4 = 213.0$			28.15			
			—	—		
			756.4	99.70		

By placing in juxtaposition the theoretical values of the alkaloid itself with the numbers obtained by experiment, a considerable deficiency in the percentage of carbon becomes apparent.

	Theory.	Found.
Carbon	80.23	79.10
Hydrogen.	11.62	11.20

This deficiency was subsequently traced to the difficulty experienced in burning the body. Equally low results were at first obtained on burning the platinum compound. On substituting chromate of lead for cupric oxide the higher percentages were realized.

A determination of the chlorine in the double salt was also made. For this purpose .244 gram of the substance was put into a tube with 3 c.c. of nitric acid (1.5), and an excess of nitrate of silver. The tube was sealed, heated to 200° C., and maintained at that temperature for four hours. At the end of that time, decomposition being complete, the tube when cold was opened, and the resultant chloride of silver was collected, washed, dried, and weighed. It gave the equivalent of 27.67 per cent. of chlorine as against 28.15 per cent. The platinum in the filtrate from the chloride of silver appears in No. 5 estimation of platinum salt (*q.v.*).

Hydrochlorate of the Alkaloid.—This salt was prepared by neutralizing the dry base with a weak solution of hydrochloric acid and evaporating to dryness. .2005 gram of alkaloid gave .244 gram of dry, amorphous, yellow-tinted residue. The formula $C_{23}H_{40}N_2 \cdot 2HCl$ requires .243 gram. Other salts were prepared, but as they did not crystallize, they were not deemed the most suitable for the purpose of this inquiry. From the composition of the hydrochlorate the *diacid* nature of the base may be inferred.

Ethyl Derivative of Alkaloid.—If hymenodictyonine be dissolved in twice its weight or more of alcohol, ethyl iodide be added in excess, and the mixture be heated in a sealed tube at 100° C.; the mixture gradually assumes a dark colour. If the temperature be maintained for two hours and then the tube be allowed to cool, abundance of crystals of an ethylated compound will separate out. A further crop of crystals may be obtained by concentrating the filtrate. Under a lens they are seen to form long needles and to arrange themselves in rosettes. The product after being well washed in cold alcohol and recrystallized from hot alcohol is obtained in a pure condition.

Two estimations of the iodine in the compound were made, and

gave of iodide of silver equivalent to 38.46 and 38.50 per cent. of iodine respectively.

These percentages would correspond with a body having the formula—



The platinum salt of the diethyl derivative was also obtained. It was prepared from the iodide by removal of its halogen as silver iodide, substituting chlorine and precipitating with perchloride of platinum. It is very soluble in hot water, and crystallizes with great boldness on concentrating the solution. Cold alcohol exerts only a feebly solvent action upon it.

It gave on ignition the equivalent of 24.00 per cent. of platinum. The formula $[\text{C}_{23} \text{H}_{40} (\text{C}_2 \text{H}_5)_2 \text{N}_2]'' \text{Cl}_2 \text{Pt Cl}_4$ requires 24.29 per cent. of platinum.

These results agree in pronouncing the beautifully crystalline iodine compound to be the *diethylated iodide of hymenodictyonine*, having the composition as indicated above. Further, the formation of this compound shows the *diammonic* nature of the alkaloid, and if this fact be taken in conjunction with the mode in which the base combines with ethyl iodide, it may be justly inferred that hymenodictyonine is a *tertiary diamine*, having the molecular weight represented by the formula $\text{C}_{23} \text{H}_{40} \text{N}_2$.

Lastly, these results present a close analogy in their chemical properties between nicotine and hymenodictyonine, and afford substantial evidence in favour of the homology of the two substances.

Although lack of material at the present time has prevented me from making a more complete study of this interesting alkaloid, it is hoped that its chemistry has been pursued to an extent sufficient to justify the physiologist in putting the alkaloid to the test. This is the more important from the reputation which the drug has acquired as a tonic and a febrifuge among the Hindoo natives.

Again there remains to me the pleasing duty of acknowledging the kind services which my friend Mr. T. G. Nicholson has rendered me throughout this investigation.

The PRESIDENT in proposing a vote of thanks to Mr. Naylor, said on the last occasion when this question was brought forward, some doubt was thrown on the exact composition of the alkaloid on account of the imperfect manner in which it was then known; but Mr. Naylor had now succeeded in clearing up that point by producing the alkaloid in crystals, which result was highly satisfactory.

Mr. GERRARD congratulated Mr. Naylor on the results of his work. He would ask him whether he had endeavoured to prepare any bromine or iodine direct substitution compounds, and if so, what results he obtained. He was much pleased to find that Mr. Naylor had been able to obtain the alkaloid itself in a definite crystalline form, and also that he had used ether for that purpose. In his own work he found that by using pure washed ether he could obtain the most satisfactory results in the crystallization of alkaloids.

Mr. NAYLOR, in reply, said he had only prepared a bromine substitution compound, and he had not yet had time to examine that.

The next paper read was a—

NOTE ON THE FILTRATION OF LARD.

By W. WILLMOTT.

A recurrence to the subject of the treatment of lard in its preparation for an unguent basis appears, I am bound to confess, to call for some apology. My reason, however, for again bringing before the Conference this question, is as follows:—Certain conclusions arrived at by me with regard to the advantages, or supposed advantages, of filtration as a means of “rendering” lard into the most perfect condition for pharmaceutical usage (and advanced in a paper read before the Conference meeting in the autumn of last year), have been controverted by some eminent pharmacists. This circumstance, although not, I confess, altogether unlooked for, I feel I cannot pass by in silence.

In the paper mentioned, I stated as the result of certain experiments, that washing and straining, or washing and filtering, were without advantage in the preparation of lard for use as an unguent basis; and, further, that filtration *per se* possessed no advantage in practice. In reply to this, Mr. Conroy said “he found that by filtration he got a most excellent product which would keep good and sweet. He did not consider washing to be of much use, but careful filtration was necessary to separate decomposable matter.” On a subsequent occasion, Professor Redwood, at an evening meeting of the Pharmaceutical Society,* expressed his opinion on this same point as follows:—“Complete separation of all suspended matter is obviously important, and therefore filtration seems desirable where practicable.” In conjunction with these opinions I ought, perhaps,

* *Pharm. Journ.* Nov. 10, 1883, p. 865.

to notice the conclusions arrived at by Mr. Edward Smith in his paper read at the Conference meeting held at Exeter in 1869. In this paper we meet with the most emphatic advocacy of filtration as "the best means of preparing lard" for use in pharmacy. Mr. Smith says:—"I cannot too strongly insist that if lard be required of first quality, it is absolutely essential that it should be filtered through paper . . . the germ of success lies in filtration . . . to strain is to invite inferiority, to filter is to secure superiority, if not perfection."

In view of these very authoritative statements it seemed desirable to me to repeat my experiments in greater detail, and to submit this particular point to a most careful and very special observation, in order to verify or otherwise the conclusions I had advanced. To carry out this with all possible completeness the following specimens were severally prepared:—

Strained.

No. 1. Perfectly fresh "flare" melted in water-bath and strained through fine tow.

No. 2. As No. 1, but subsequently dehydrated* at a little above 212° F., and strained through tow.

No. 3. As Nos. 1 and 2, but with the straining through flannel.

No. 4. As Nos. 1 and 2, but with the straining through fine linen.

Filtered.

No. 5. As Nos. 1 and 2, but subsequently filtered through paper at 150° F.

No. 6. As Nos. 1 and 2, but subsequently filtered through paper at 200° F.

Washed.†

No. 7. As No. 1, but subsequently washed, heated, and strained through flannel.

Before stating the results shown by working with these prepared specimens, it would be well, perhaps, to ascertain what is really involved in the process of filtration to which, as will be seen, Nos.

* The method of dehydration here employed was that laid down in the 1864 Pharmacopœia, and is as follows: "Again heat it" [the strained lard] "on the water-bath, stirring continually until it becomes clear and entirely free from water." There can scarcely be a doubt, however, that this result is better, though not perhaps so conveniently arrived at, by allowing the fresh fat to be "hung up and freely exposed to air and light."

† In accordance with process described by Mr. Martindale, *vide Pharmaceutical Journal*, November 10, 1883, p. 374.

5 and 6 were carefully submitted.* The following table will show the very large divergence of result under varying conditions:—

Quantities, in weight, of Lard passing through various filtering and straining media at different temperatures during one hour; the funnel and filter being of the capacity of two imperial pints.†

Filtering and Straining Media.	100—110° F.	150—160° F.	200—210° F.
French circular paper	17 oz.	33 oz.	91 oz.
Thick grey paper	40 oz.	95 oz.	183 oz.
Fine linen	62 oz.	Passes through freely at above temperatures.	
Flannel	Passes through freely at all temperatures a little above the melting point.		
Fine tow	Passes through freely at all temperatures a little above the melting point.		

It should be stated that these quantities will vary to some extent, according to the following conditions, viz.: (1) the particular manner in which the operation is conducted; (2) the time, if any, allowed for running (for running it simply is) through the porous substance before the moment of commencing the trial;‡ (3) the constancy with which the filter is kept filled; (4) the exact size of the filter; and (5) the quality and character of the paper, etc., used in the process. Nor is this all: it is important to note that the rate of filtration diminishes as the time progresses. This is a material consideration, as it modifies very much the apparent ease and simplicity of the operation, and forms a contingency which at the outset may readily be lost sight of. The following will show this

* Mr. Conroy says: "There is no necessity for any length of time to be occupied, as at a temperature of about 200° F. lard easily runs through filtering paper." This is perfectly true so far as it goes, but I venture to think that the process cannot, either with reference to practicability or otherwise, be dismissed in so summary a manner.

† In each instance the process was allowed to proceed for five minutes before noting the moment of commencing the hour.

‡ With thick grey paper at a temperature of 200°, no less a quantity than 2 lbs. 12 oz. literally runs through during the first five minutes. After one hour's filtration this quantity is reduced to 6 oz. for the same time; or 13 oz. if the paper be removed and cleansed from all extraneous matter adhering to its surface.

most clearly. With French grey circular paper at a temperature of 150–160° F. there will filter through during the first hour 33 avoirdupois ounces; during the second hour, 13 ounces; the third hour, 9 ounces; and the fourth hour, 7 ounces. At a temperature of 200–210° F. we get for the first hour 91 ounces; the second, 35 ounces; the third, 23 ounces; and the fourth, 16 ounces. All this shows a gradual clogging up of the pores or interstices of the paper, rendering renewal (which is a very undesirable condition) imperatively necessary for the free progress of the operation. Thus it will be seen that the process of filtration, in addition to being something more than troublesome, is not so practicable or available as may at first appear.

But now the question arises, Is filtration necessary, or will straining through flannel or fine linen suffice to remove or keep back all solid or suspended matter which may subsequently tend to promote decomposition in the prepared substance? * Partly to determine how far such may be the case, a portion of each of the above-mentioned specimens, Nos. 1 to 7 inclusive, was allowed to pass into a test tube, and all being subsequently melted at the same temperature, the difference in clearness and uniformity of condition, when examined by transmitted light, was practically *nil*.† It simply remained, therefore, to test these specimens in the form of the most readily changing ointments, and to note carefully the results.

Table showing generally the effect as regards rancidity in the two most rapidly decomposable ointments when prepared respectively with strained and filtered lards.

UNGUENT. Summer. Temp. 65° to 80° F.	STRAINED. Specimens 1, 2, 3, 4.	FILTERED. Specimens 5, 6.	WASHED. Specimen No. 7.
Ung. plumb. carb., 4th week.	Changing.	Changing.	Changing.
" " 5th week.	Rancid.	Rancid.	Rancid.
Ung. hyd. n. ox., 4th week.	Good.	No. 6. Changing.	Changing.
" " 5th week.	Good.	No. 5. Changing.	Slightly rancid.
" " 6th week.	Slightly rancid.	Rancid.	Rancid.

* It is, I think, quite a question,—and I must confess to some doubts,—as to how far particles of membrane and tissue are “the main and often sole cause of the rancidity of solid animal fats.”

† The absolute difference in clearness, if noted as a matter of priority of porous media, may be stated thus:—Paper, 1; flannel, 2; fine linen, 3; and tow, 4.

A third ointment was also under observation, namely, ung. pot. iod. sine pot. carb. All the specimens of this soon became tinged or discoloured, such difference as was observable being distinctly to the disadvantage of those prepared respectively with the washed and filtered lards.

This general statement will suffice, I think, to show that, so far from the filtration of lard possessing any advantage in practice, the operation is one which, if I may be allowed so to express it, will be found to be "more honoured in the breach than the observance."

From these results, then, I find my former experiments clearly corroborated, and, furthermore, I am able to state that the most desirable method for adoption in preparing lard for use in pharmacy is one corresponding to that suggested by Professor Redwood on the occasion already referred to; or one assimilating, with some slight modifications, to the process of the British Pharmacopœia of 1864. These processes exclude both washing and filtration, and are undoubtedly the best that can be devised with a view to meet the object, or objects, desired to be attained.

I must again ask the indulgence of the Conference for bringing forward this well worn subject, but inasmuch as it may confidently be assumed that prepared lard will not disappear from the *régime* of pharmacy, the method of treatment best adapted to secure the most satisfactory results can scarcely, perhaps, be too well considered.

The PRESIDENT said they were all indebted to Mr. Willmott for this very practical paper. The subject, though a well worn one, was of constant interest to those practically connected with pharmacy. If filtration really gave no practical advantage, it was very satisfactory to know it.

Mr. NAYLOR said this paper had not rendered it at all clear to his mind that filtration was injurious, or that if Mr. Willmott had performed the operation on a very large quantity of material, say half a ton of flare, he might not have obtained somewhat different results. Nor were the results, as he had announced them, very striking, except that they tended to show that it would be very unwise to attempt filtration through ordinary filtering paper. There was one other point which would have thrown considerable light on this question, which he referred to last year. He did not altogether understand the vague expression "rancid." How was the rancidity tested, by the smell, the taste, by litmus paper, or by

determination of the amount of acidity? On this point he should have liked to have seen some better evidence brought forward. The difference would not be appreciable by the smell, he presumed, nor would a few degrees of rancidity be appreciated by litmus paper, or any physical appearance which the ointment might present. He was still of opinion, from operating on very large quantities of flare, that it was better to melt it at a low temperature and then to rapidly pass it through filters; in that way a better looking product was obtained physically, and if the temperature was not raised too much and the filtration were conducted rapidly, so as to remove all membranous matters, the product would keep well for a considerable length of time.

Professor REDWOOD said he had not been so disappointed in the paper as Mr. Naylor seemed to have been, for he considered Mr. Willmott had done good service to the interest of pharmacy by the experiments he had made. It appeared to him that those results were such as might have been anticipated, and were corroborated by his own experience. He had lately had a great deal of experience, a little outside pharmacy, with regard to the means of preparing animal fats in a state in which they would resist the influence of contact with atmospheric air for as great a length of time as possible. The estimates he had been compelled to form in reference to this subject, no doubt would not be quite approved by Mr. Naylor as being strictly scientific. Nevertheless, they were such as practical men were in the habit of employing, namely, an observation of the physical characters of the substances under investigation. It was not very easy with such a substance as lard to be able to indicate the successive changes which take place in it quite scientifically, but it was comparatively easy to ascertain what and when changes took place which were calculated to interfere with the application contemplated. This was pharmaceutically at the present time a very important subject; for some time past there had been a great deal of discussion and no small difference of opinion expressed as to whether it were desirable or not to retain animal fats as bases of pharmaceutical preparations, and those who had the supervision of the new edition of the Pharmacopoeia had received a vast number of suggestions from medical men and others, to the effect that the time had come when animal fats should be excluded altogether from use as bases of external applications. He could not in the slightest degree sympathize with that opinion, believing that for a great part of the class of unguents employed in medicine there was no basis comparable to good, sweet, well pre-

pared lard. The conclusion he had himself come to closely coincided with that expressed in the paper: that for the purification of lard or any animal fat, it was desirable that the operation should be carried on at as low a temperature as possible; that it should be freed as much as possible from other matters which were liable to become diffused in thin scales to a greater or less extent, and that the process should be conducted with as little exposure as possible either to water or to atmospheric air. These were the points to be specially aimed at. Every one appeared to be of opinion that the freedom from foreign matter in lard was an object to be aimed at, and that this should be carried on without exposure to atmospheric air. He would hazard the opinion that the bad effect which Mr. Willmott had found to arise from fine filtration was, at any rate to a great extent, ascribable to the fact that the operation was necessarily comparatively slow, and with a medium of that description there was no doubt much greater contact with atmospheric air. All porous bodies had a large amount of atmospheric air adhering to the surfaces, and in passing such a substance through a porous medium, it was really being subjected to a much more severe test than would otherwise be the case. That appeared to him to lay at the foundation of the different experiences in the experiments which had been narrated.

Mr. COOKE (Wandsworth) said he did not understand Mr. Naylor to say that he considered the experiments valueless, but that the results were disappointing, and he must say he somewhat sympathized with him. Upon a consideration of the nature of lard and the rapid changes which took place in it, the question for them as practical men, was, whether exposing it to filtration did not do more injury than good. If it were filtered through very fine paper it took a considerable time, and that meant its being exposed for a continuous time to a considerable heat. As they had heard, at 150° you got 33 ounces per hour, and at 200° a considerably larger quantity. That showed the higher the heat the more rapid the process; but was it desirable to apply even as much as 150° ? What was removed by filtration was more than counterbalanced by the continuous application of heat and exposure to the atmosphere. His own experience was that the lower the heat applied and the more rapid the operation, the more satisfactory would be the result.

Mr. WILLMOTT said after the exceedingly able remarks of Professor Redwood, there was little left for him to say. Mr. Cooke only corroborated the conclusions he himself had arrived at. Mr. Naylor complained of the results being disappointing, but he could not

command results, and if they were not striking, it was certainly not his aim to make them so. His object was to show that filtration possessed no advantage, and not only did it possess no advantage, but, on the contrary, a slight disadvantage. With regard to rancidity, he mentioned on the last occasion that he made no attempt to examine the specimens chemically, since there was no difficulty in determining whether any specimen of ointment or lard was sweet or not. He was simply guided by physical characteristics.

The next paper was entitled—

THE COMPOSITION OF SEIDLITZ POWDERS.

By WILLIAM MARTINDALE, F.C.S.

In the early spring of last year, while the weather was still cold, I had a box of seidlitz powders returned to me by a lady, who complained that when mixed a foam or "scum," as she termed it, rose on the top of the effervescence and covered the sides of the tumbler. On testing one in the ordinary way, I found that what she stated was quite true. Further, on dissolving the contents of each paper separately in water, clear solutions were formed; but on mixing these solutions, especially if somewhat concentrated, a similar but not uniform result was produced. The constituents of the powders, which were obtained from the most renowned makers, I next tested for lime, but scarcely found a trace. On allowing the brisk effervescence to cease and stirring occasionally, after an hour, I noticed at the bottom of some of the tumblers a quantity of white sediment—not the same amount in each—whilst in one there was none. I then checked the weighings of the contents of each paper, and found that although the alkalis were fairly correct—160 grains in each—the acids had been two liberally weighed. Some weighed as much as $39\frac{1}{2}$ grains; the acids in a box of the same lot gave an average weight of nearly 37 grains, $35\frac{1}{2}$ grains being the lowest (I ought to add my seidlitz powders are always *weighed*, not *measured*). I was a little puzzled, but the variation in weight showed the cause of the precipitate. If mixed in exactly neutralizing proportions no precipitate was formed.

On collecting some of the precipitate from the bottom of a tumbler, I found it was dissolved by liquor potassæ, and this solution, if acidulated by acetic acid, let fall a granular precipitate

again, showing that it was, as I had suspected and tried by tasting it, acid tartrate of potash. It is true, if the water used in mixing the powder has been one rich in lime, the precipitate will contain some tartrate of lime. This also is soluble in liquor potassæ, and on carefully adding a slight excess of acetic acid the lime first separates as a fine white precipitate, but is readily redissolved on adding an excess of acetic acid, when the granular precipitate of acid tartrate of potash begins to form. That lime present in the water does increase the amount of the precipitate and help to form the foam, I do not doubt, as I readily found it present, and in variable quantity by slightly washing with and dissolving the precipitate in distilled water, and applying oxalate of ammonia. It appears to be present in the precipitate about in the same proportion that it is in the water used; I found the precipitate from the Hastings water yielded little of it, that from the West Middlesex Water Company (*ex* Thames) more, and that from a well in Queen Square, Bloomsbury, much more. I had occasion to examine the water from this well some years ago, and found on evaporation that it yielded an abnormal quantity of lime salts; it is now closed to the public. Still lime in the water is not an essential for the production of the foam. I find on mixing a powder with 40 grains of tartaric acid in a small quantity of distilled water even a considerable quantity of foam is produced.

As I have before said, on mixing a seidlitz powder in only a small quantity, say six ounces of water, the amount of foam on the surface of the effervescence, and also the amount of the precipitate, were increased; these were also increased by reducing the temperature of the water. I have noticed, too, as one would naturally suppose, much more precipitate is immediately formed if the powder be mixed the wrong way, *i.e.*, by dissolving the acid powder first and then adding the alkali, in place of the reverse. I also noticed that mixing a seidlitz powder reduced the temperature of the water from 2° to 4° F., varying according to the amount of water and the temperature of the surrounding atmosphere. It has, therefore, appeared clear to me that the foam of which the lady complained and the precipitate which I have mentioned are only caused when an excess of acid is used; they are increased by using a small quantity of water, and by having this at a low temperature, and also by the water containing lime in solution. It is true, on mixing a neutral seidlitz powder in a very small quantity even of distilled water, say five ounces, the foam on the surface of the effervescence does rise, but it is soon redissolved.

L L

Reviewing these experiments, the question arises, What should the composition of a seidlitz powder be? It is well known that it is not intended to represent the water of the seidlitz spring in Bohemia, from which it gets its name. This water contains principally sulphate of magnesia in solution, with a small quantity of sulphate of soda, lime salts, etc. Christison, however, seems to think it is probable that the term "seidlitz," applied to these powders, is a corruption of the name of the Rochelle apothecary, Seignette; he for a long time secretly prepared the principal ingredient in them, what is commonly called Rochelle salt, or in French, *sel de Seignette*.

All the English and American authorities that I have consulted agree as to the quantities of the ingredients in the alkaline powder; all give tartarated soda, 120 grains, bicarbonate of soda, 40 grains, as the composition of this. In the French Codex the powder is altogether weaker; it has *Poudre Gazogène Laxative*, with *syns.*:—*Sedlitz** powder (British Pharmacopœia), *Pulvis effervescens laxativus*, the composition of which is bicarbonate of soda, 2 grams (about 31 grains), tartrate of potash and soda, 6 grams (about 93 grains), and tartaric acid, 2 grams (about 31 grains). As regards the quantity of tartaric acid to be used in conjunction with the 160 grains of mixed alkali, mentioned above, authorities vary very much. Pereira's "Materia Medica" gives 30 grains; Paris's "Pharmacologia" 35 grains, and says, "The acid being in excess (?) renders it more grateful, and no less efficacious." Next, the United States Pharmacopœia, 1882, has *Pulvis effervescens compositus*, with 35 grains of tartaric acid (in their Pharmacopœia of 1870 it had 36 grains); Squire's "Companion" gives 37 grains; Attfield's "Chemistry" 40 grains, and says that the salts swallowed are tartrate of potassium and sodium, tartrate of sodium, and acid tartrate of sodium (?) or of potassium, and that excess of acid gives an agreeable acidity to the draught. I am doubtful about this; to me the cream-of-tartar-like taste of acid tartrate of potassium as a granular precipitate is not agreeable.

Theory would require 35·714 grains of tartaric acid to neutralize 40 grains of bicarbonate of soda; but as the best commercial tartarated soda is generally faintly alkaline, I find that after eight hours, when all the effervescence has passed off from the solution of a mixed seidlitz powder, it has a faintly alkaline reaction, even if 86 grains of acid have been used, although the carbonic acid it

* *Sic*, although indexed as seidlitz powders.

contains gives it an acid reaction when the brisk effervescence has just ceased. This quantity of acid, 36 grains, is what I have always used, and what I have inserted in the "Extra Pharmacopoeia," after well weighing the different authorities and being aware of the results of the above experiments.

As seidlitz powders are often medically ordered, I think that a formula for them should be inserted in the British Pharmacopoeia, and in fact, seeing how they vary in the amount of acid they contain, where the prescriber expects no variation, it is necessary that a formula should be there; much more necessary than that one for "solution of citrate of magnesia," which is rarely used in England, should find a place there.

In addition to the ordinary seidlitz powders in use, there are what I may term "fancy" seidlitz powders sold. Some are flavoured with lemon, some with ginger, and to others $\frac{1}{100}$ grain of tartar emetic is added to each powder, on the ground that, as Dr. Paris states, "this quickens the operation of saline cathartics." Without wishing to discourage the use of these, I think that when a physician orders a seidlitz powder, it should be something definite, for which there should be an authoritative formula. "Extra strong" seidlitz powders are sometimes asked for, and prepared by adding 60 or 120 grains more of tartarated soda to each powder; for these, too, an authoritative formula might be given.

At the conclusion of the paper Mr. Martindale gave the analyses of several seidlitz powders which had been obtained from so-called stores, the result of which was that there was in them a considerable excess of carbonate of soda, the cheaper ingredient, as compared with the Rochelle salt and tartaric acid, so that they would not be likely to get this precipitate of acid tartrate of potash from the cheap seidlitz; it would only be present where there was an excess of the dearer article, tartaric acid.

The PRESIDENT, in proposing a vote of thanks to Mr. Martindale, said his suggestion that there should be a recognised formula for seidlitz powders was well worthy of consideration. One expression used in the paper, "foam," was, he thought, new in chemical nomenclature.

Mr. ATKINS said they were much indebted to gentlemen who brought forward such practical papers as this, and he wished they had more of them. It taught them how much they were constantly observing without reflecting on what they saw.

Mr. KINNINMONT said in his locality seidlitz powders of ordinary strength were occasionally asked for, but they sold at least twenty double strength powders for one single strength. He should like to know whether Mr. Martindale had examined Eno's fruit salt. It presented an appearance very much like the first seidlitz powder shown, and it struck him it was simply the ordinary form of seidlitz powder with an excess of alkali. He was much struck with the word "foam," and had no doubt, if it were introduced, "Martindale's foaming seidlitz" would take the market. There had been about a dozen various receipts for Eno's fruit salt, but he found on examination it was simply a seidlitz powder with sugar and excess of alkali.

Mr. MARTINDALE said he had not examined Eno's fruit salt, but was always under the impression that it contained some chlorate of potash. Double seidlitz powders were rarely asked for in the south; he did not sell one a week. They were certainly not so much in demand as they seemed to be in Glasgow.

The following paper was read by Mr. Benger—

THE PUNGENT PRINCIPLES OF PLANTS.

By J. C. THRESH, D.Sc., F.C.S.

The object of this paper is to place on record the results of investigations upon which I have been engaged from time to time for the last three years. Unfortunately the difficulties attending the isolation of these pungent principles have been so great that the value of these results bears no relation to that of the labour expended. This fact, together with the knowledge that for some time to come my time for investigations of this character will be very limited, has led me to publish the results in their present unfinished form. I had hoped to have carried the research further before Conference, but an unfortunate fire at my laboratory destroyed the whole of a comparatively large quantity of an active principle which had cost no end of trouble to isolate and purify.

By "pungent" principle here is referred to a class of bodies destitute of odour, possessing a purely burning taste, and neither bitter, nauseous, nor acid. The best known drugs containing such principles, as cayenne pods, the rhizomes of ginger and galangal, the peppers, and grains of paradise. Prior to my isolation of capsaicin nothing whatever was known as to the nature of the constituents

upon which the pungency depended. Bucholz had indeed examined the fruit of a capsicum, and obtained a red oily fluid of intense pungency, which he named capsicol, but its very properties showed that it was not a pure proximate principle.

In plants these pungent matters invariably occur associated with resins, and generally also with fats and volatile oils. But whilst in cayenne there is an abundance of fat and little resin or volatile oil, in ginger and pepper there is an abundance of resinous matter and volatile oil, and very little fat. In galangal the fat predominates, in grains of paradise the resins. As yet the active principle of cayenne pepper is the only one obtained in a crystalline condition, the viscid straw-coloured fluids obtained from the other drugs closely resembling, however, capsaicin after having been melted. (After melting, it will be remembered, it remains, frequently for a considerable time, in the semi-fluid condition.) All attempts to prepare gingerol and paradol in crystals have failed, the process by which crystalline capsaicin is procured not being applicable in isolating any other of the active principles; but it is especially worthy of remark that when capsaicin is isolated by any process in which treatment with lead acetate, etc., is resorted to, it is obtained in the fluid state and obstinately resists all efforts to make it crystallize. It is possible that gingerol, paradol, and the other pungent principle are crystallizable substances which, from presence of some trace of impurity, are prevented from crystallizing. This impurity very probably is a terpene polymer (*vide Pharm. Journ.*, 3rd series, xii., 721), but if so, an excessively minute trace must be sufficient for the purpose.

In the plants examined the pungent matters are all found to possess the following characters in common:—

Ready solubility in 50 per cent. alcohol, ether, chloroform, benzol, carbon disulphide, turpentine, acetic acid, and dilute solutions of potash.

Slight solubility in cold petroleum ether.

Insolubility in solutions of ammonia and of alkaline carbonates.

Ready destructibility when treated with oxidizing agents. With moderately strong nitric acid, much carbonic acid is evolved, and oxalic and succinic acids are formed, a complex mixture of resins and one or more acids of the fatty series. Oxidized with alkaline permanganate, oxalic acid is formed in abundance, the only other product (in cases examined, gingerol and paradol) being a caproic acid, $C_6H_{12}O_2$. Warmed with acid permanganate, CO_2 is evolved with brisk efflorescence. Warmed with chromic acid mixture, two-

thirds of the carbon is given off as CO_2 and fatty acids, and the remainder as a volatile neutral substance which resists further treatment with the oxidizing agent.

All have a density only slightly exceeding that of water. Gingerol and paradol, when carefully heated, begin to decompose at a temperature a little over 100°C ., becoming darker in colour and evolving an inflammable gas, and from 2–3 per cent. of a colourless, limpid liquid distils. The temperature rises rapidly to about 182°C ., when about 5 per cent. of a yellowish, less limpid distillate is collected. The temperature then goes on increasing until too high for the mercurial thermometer to register, when about 40 per cent. of a thick, reddish-coloured oil condenses. The residue in the retort is solid when cold, of empyreumatic odour, and pitchy appearance.

Combustions have been made of capsaicin, gingerol, and paradol. The ultimate analysis of the former showed that its empirical formula was most probably $\text{C}_9\text{H}_{14}\text{O}_3$ (*Pharm. Journ.*, 3rd series, vii. 473). Though vastly less pungent, paradol appears to have the same empirical formula. Three separate quantities of paradol (a), (b), and (c) were obtained by the following processes; and as on their combustion concordant results were obtained, there is little possibility of error.

(a) A tincture of the seeds made with 50 per cent. alcohol was precipitated with basic lead acetate, and the filtrate evaporated to remove the spirit. The semi-fluid matter which separated after removing the lead and the spirit was well washed with cold petroleum ether, then repeatedly boiled with the same solvent, and the matter which was deposited on cooling used for the combustion.

(b) Some finely powdered seed was exhausted with petroleum ether, most of the latter distilled off and the deposit dissolved in spirit and precipitated with lead acetate and ammonia. In the filtrate the lead was removed by H_2S , and then carefully evaporated and the paradol removed by agitation with chloroform.

(c) An ethereal tincture of the seed was mixed with excess of petroleum ether, and the crude paradol which separated was dissolved in dilute alcohol precipitated with lead acetate and shaken with petroleum ether. (To remove resin salt soluble in petroleum ether.) The alcoholic liquid was then treated with H_2S , etc., as in (b), to obtain the pure active principle.

Each specimen was well dried over H_2SO_4 *in vacuo* before combustion. Sample (b) was a shade darker than either (a) or (c).

	Paradol used.	CO ₂ formed.	H ₂ O formed.
(a)	·4584	1·1785	·8785
(b)	·8180	·8172	·2612
(c)	·4033	1·0842	·8306

From which we calculate—

	C.	H.
(a)	70·11	9·18
(b)	70·06	9·25
(c)	69·94	9·11
Mean—	70·04	9·18
C ₈ H ₁₄ O ₂ requires	70·13	9·09

The substances were burnt with copper oxide in a current of oxygen. There is but little doubt, therefore, that paradol is isomeric with capsaicin, the analytical results being almost identical. Apart from their different physical properties they do not yield the same products on oxidation with chromic acid mixture. The fatty acid obtained by oxidation of the very small quantity of capsaicin which I possessed appeared to be valerianic from its odour and per cent. of silver yielded by ignition of its silver salt. Paradol under similar circumstances yields a mixture of fatty acids, apparently a caproic and a heptylic acid, with a little formic acid. The silver salt obtained by adding silver nitrate to the solution of the sodium salts of the sudorific smelling oily acids gave as a mean of two determinations 47·21 per cent. silver.

Silver Salt.	Silver yielded.	Percent. Silver.
·8666	·1729	47·16
·2804	·1825	47·26

By fractional precipitation a silver salt was obtained which gave on analysis 48·84 per cent. Ag, and another yielding 45·59 per cent. Ag.

·2130	·0971	45·59
·0432	·0211	48·84

C₆H₁₁O₂ Ag contains 48·43 per cent. Ag.

C₇H₁₃O₂ Ag „ 45·57 „

Besides these acids a neutral limpid fluid is obtained which is insoluble in water and dilute alkalies, slightly soluble in S. V. R., the latter solution not being coloured by ferric chloride or reduced by silver nitrate and ammonia, nor apparently affected by further digestion with the oxidizing solution. It was in the hope of being able to prepare a sufficient quantity of this fluid for a more extended examination that I had made the quantity of pure paradol which has previously been referred to as having been destroyed by fire.

2.148 grams paradol yielded, on oxidation, 2.201 grams $C O_2 = .600$ gram C, and fatty acid estimated to contain .432 gram C. As the above quantity of paradol would contain 1.506 gram C, we have .475 gram (or about one-third) to be accounted for. The neutral limpid oil as yet unexamined no doubt represents this.

Gingerol appears to differ but little physically from paradol. If anything, it is more soluble in petroleum ether than the latter, and reduces silver salts more readily. Upon oxidation with chromic acid mixture it yields apparently acetic and caproic acids, and a volatile oil probably identical with that from paradol. It is more easily affected by heat, decomposition perceptibly commencing when heated to a little over $100^\circ C$. This property, and the fact that in the ginger rhizome it occurs associated with from three to five times its weight of resins, etc., which it is exceedingly difficult to remove, causes its preparation to be an exceedingly tedious process. A number of combustions of gingerol, obtained by different methods, have been made, but only by operating in the following way can a product be obtained yielding constant results. The ethereal extract of ginger is treated with proof spirit, the tincture thus obtained precipitated with basic lead acetate, and filtered. The lead is removed by H_2S , and the clear liquid distilled under diminished pressure until the alcohol is removed, and the aqueous fluid poured off the crude gingerol which has been deposited. This is dissolved in a little ether and several volumes of petroleum ether added, the precipitated gingerol (still impure) is redissolved in spirit, basic lead acetate added, and the lead in the filtrate removed as before. After distilling off the spirit, etc., the active principle is once more dissolved in ether, and petroleum ether added until considerable turbidity is produced. After standing the clear supernatant fluid is decanted and distilled. The gingerol thus obtained is perceptibly paler in colour than that precipitated by the addition of the petroleum.

The following combustions were made with gingerol thus obtained :—

	Gingerol Burnt.	$C O_2$ formed.	H_2O .
(1)	.3875	1.0125	.3352
(2)	.3625	.9490	.3203

The percentage composition is therefore,

	(1)	(2)	$\times C, H, O$ requires.
C	71.27	71.39	71.43
H	9.61	9.82	9.52
O	19.12	18.89	19.05

The mean of three concordant combustions of the portion precipitated by the last treatment with petroleum ether gave—

C, 72.99

H, 9.49

Resin β , the one most difficult to remove, has previously been shown (*Pharm. Journ.*, 3rd series, xii. 721) to contain 73.27 per cent. C and 8.55 per cent. H, hence it is probable that a small quantity of this is contained in this impure principle.

784 gram oxidized yielded 696 gram $C O_2 = 189$ C, and fatty acids calculated to obtain 144 gram C, leaving rather more than one-third for the neutral oil at same time formed. A larger quantity was oxidized, and the distillate, after being neutralized with normal $Na H O$ solution, was concentrated and standard acid added to liberate half the acids. The globules of oil were taken up by petroleum ether, and required 13 c.c. soda solution to neutralize. All the reaction of this solution pointed to the fatty acid being normal caproate. Upon determining the metal in the silver salt,—2515 gram yielded 1219 gram silver, or 48.52 per cent. ($Ag C_6 H_{11} O_2$ requires 48.43 per cent.)

The liquid from which this acid had been removed was treated with more acid and re-distilled. The solution gave all the reactions of dilute acetic acid. The barium salt was obtained, and the barium estimated as sulphate.

1.0110 gram of the salt yielded .9340 gram $Ba S O_4$, or 92.38 per cent. Pure $Ba 2 C_3 H_5 O_2$ would yield 91.38 per cent. The too high result obtained was afterwards satisfactorily accounted for.

Paradol like gingerol and the other pungent principle examined forms compounds with the heavy metals, most of which are insoluble in water but soluble in dilute alcohol. They are amorphous, viscid, reddish substances, which however obtained form a sticky resinous layer on the sides and bottom of the containing vessel. So far as examined no reliable information was obtained as to their composition, which seemed most variable. In chloroformic solution paradol, gingerol, etc., combine with bromine, but as the fluid becomes of a dark brown colour it is difficult to tell when sufficient Br has been added. Towards the end of the reaction $H Br$ begins to be evolved, and on evaporation of the chloroformic solution decomposition takes place.

3.065 grams paradol combined with 4.5 grams bromine. Probably therefore a compound having formula $C_{18} H_{28} Br_6 O_4$ is formed. This formula requires

Br.		Paradol.
155.8	to	100
Found.		
146.8	to	100

Treated with strong alcoholic or aqueous solution of potash, or with fused potash, a reddish brown hard soap results, insoluble in strong alkaline or saline solutions. No protocathechuic acid (or allied bodies) is formed; in fact the resinous acid of the soap appears to be the sole product left in the solution or fusion.

Upon dissolving the soap in water, decomposing, with acid, etc., a soft resinous mass separates, which was redissolved in a small quantity of alkali, and reprecipitated with CO_2 .

The soft odourless and tasteless resin thus obtained was dried, and a portion burnt with following results: .3154 gram substance gave .2474 gram H_2O and .8553 gram CO_2 .

Possibly the formula of this body is $\text{C}_{17}\text{H}_{24}\text{O}_3$.

	Theory.	Found.
C . . .	78.91 . . .	73.97
H . . .	8.69 . . .	8.72

This differs from the formula which possibly represents paradol, $\text{C}_{18}\text{H}_{28}\text{O}_4$, by the elements of methyl alcohol, CH_4O .

Paradol can be dissolved in cold strong sulphuric acid to a blood red solution, which if poured into much cold water produces a mere turbidity. If warmed, however, brown oily drops immediately separate.

The pungent principle of the fruits of *Piper nigrum* I have not satisfactorily isolated, but very probably it is allied to gingerol and the other pungent principles just considered. An ethereal extract of black pepper was freed as far as possible from ethereal oil and piperin, and the resinous residue was readily soluble in spirit and possessed considerable pungency. When warmed with chromic acid mixture it was rapidly oxidized with evolution of CO_2 , and formation of two or more acids of the fatty series. A small quantity of an oily acid was obtained, which reacted as the caproic acid from gingerol, but the odour was unmistakably that of ordinary valerianic acid. The amount obtained was too small to admit of further experiments.

The active pungent principle of the galangal rhizome I have only been able to obtain in very small quantity, and probably only in a state of proximate purity. Upon oxidation, however, it yielded much CO_2 , together with acetic and another fatty acid. Unlike gingerol and paradol, it did not yield also a limpid neutral oil, but

a small quantity of crystalline matter was found in the distillate, which melted at about 140° F., and was not soluble in dilute alkaline solutions. The higher fatty acid had decidedly an odour recalling that of the sixth and seventh members of the fatty series, and when converted into the potassium salt, it gave with silver nitrate a very voluminous white precipitate, soluble in boiling water. The barium and calcium salts were also soluble in hot water, and deposited in minute crystals on cooling. CuSO_4 also gave a very voluminous pale blue precipitate, soluble in boiling water. Fe_2Cl_6 gave a bulky pale red precipitate.

193 gram silver salt yielded 084 gram Ag, or 43.5 per cent. It is probable, therefore, that the acid is one of those with formula $\text{H C}_8 \text{H}_{15} \text{O}_2$, the silver salts of which contain 43.08 per cent. of silver.

There is no doubt but that this principle, which for the present may be called "alpinol," belongs to the same group of bodies as paradol and gingerol.

The PRESIDENT moved a vote of thanks to Dr. Thresh for his admirable paper. He had chosen one of the most difficult branches of research, and the Conference had to thank him very much for the valuable results he had obtained.

Mr. NAYLOR desired to express his personal gratitude to Dr. Thresh for his paper, having worked on similar bodies himself, and having been compelled to put them on one side, simply because he had never been able to obtain them in a sufficiently definite condition. Dr. Thresh had now shown how they might prosecute investigations in this direction, which was a marked addition to their knowledge.

Mr. HOLMES said there was one point in connection with this very valuable research which struck him as worth asking a question upon. It was an extremely interesting fact that these pungent principles should be compounds with the fatty acids, but he did not gather that Dr. Thresh gave any intimation of opinion as to whether they were united with an alcohol or some other body of a similar nature. He hoped that Dr. Thresh would be able to add information on this point in future.

Mr. Plowman then read the following paper—

NOTE ON A SPECIMEN OF *MYLITTA AUSTRALIS*

FORWARDED TO THE CONFERENCE BY MR. A. P. MILLER, OF HOBART,
TASMANIA.

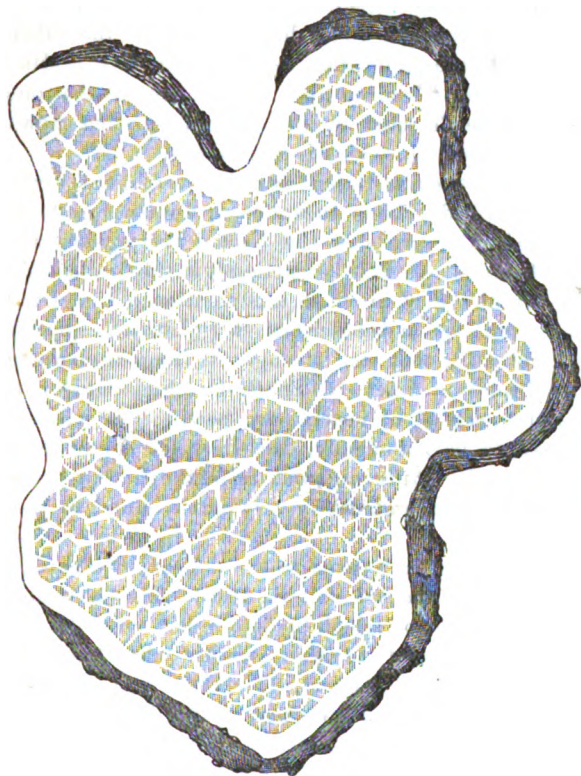
BY WILLIAM SOUTHALL, F.L.S.

As it seemed desirable that some little detailed information should be given of the interesting specimen sent to the Conference by Mr. Miller, the Honorary General Secretaries were good enough to entrust me with the duty. I fear that the compilation of information I have been able to gather will not be very complete.

The plant is catalogued in Hooker's "Botany of the Voyage of the *Beagle*," where it is described under the name *Mylitta australis*, Berkeley, as having an indurated peridium or outer covering, whilst the interior of the compact mass is dry, sub-horny, containing heterogeneous veins. Recent specimens of this Australian plant, which is used as an article of food, exhibit something like asci. There can be but little doubt that the plant is autonomous, meaning that it has an independent existence, it having been suggested by some observers that it was of the nature of a gall, or even the root of some phænogam.

The accompanying figure of a transverse section is founded upon that in Corda's "Icones Fungi," but the hexagonal character of the pits is not preserved. In the same volume is a description by Tulasne of its general characteristics, in which he says that "it is the native bread of the English colonies of Tasmania." Mr. Berkeley, to whom we owe much of the collected information respecting it, had not succeeded any more than other observers at that period in discovering the spores or any apparatus for fructification. We would rather suppose that it is a kind of mycelium. Mr. Berkeley considers it to be an ally of the true truffles. "Before drying, the solid and fleshy mass presents a multitude of regular pits, generally hexagonal—large and filled with a semi-transparent pulp of a watery-white, having something the appearance of melted wax, and is soft enough to spread under the spatula. The walls of the pits are formed by a substance pure white, opaque, and somewhat corky, which does not divide readily or regularly anyway. The same parenchyma is extended to within about 3 or 4 millimetres of the periphery of the fungus, and is further covered by a thin black bark of a crustaceous character, unequally thick and deprived of warts or regular eminences, and which detaches in plates on specimens dried before

their perfect development. The pits situated immediately beneath the corky layers are mostly smaller than those of the centre. Observed under a microscope, the two constituent substances of the fungus appear to be both formed of long twisted filaments thickly set and branched; those in the waxy matter, destined to harden without losing transparency, are finer than the others. Some of the specimens are regularly rounded and very heavy, the black



Transverse Section of Young Plant of *Mytilia australis*.

bark being rugous and adherent; others are extremely misshapen, and seeming shaken with age are much lighter." Our specimen belongs to the former category, weighing, I understand, thirty-nine pounds. It is only in fresh specimens that some of the particulars mentioned by Tulasne may be observed. Specimens like this are like the cheese in Tartary, that requires an axe to cut it, and upon this even an axe makes very little impression.

The late James Backhouse, of York, in his missionary journeys in Africa and Australia, made many botanical observations, and amongst other plants he alludes to this. He mentions that a species of tuber is often found in Van Diemen's Land, attaining to the size of a child's head. It is known by the name of "native bread," and in taste somewhat resembles boiled rice. Like the heart of the tree fern and the roots of the native potato (an orchidaceous plant), cooking produces but little change in its character. He says that he often asked the aborigines how they found the tubers, and he always received the same answer—"a rotten tree." He also mentions—which has a bearing upon its autonomy—that on dry open hills it is to be detected by the ground bursting upwards with something underneath, which is this fungus.

In other countries scattered over the earth are various plants more or less allied. Thus tuckahoe, or Indian bread, is found in Carolina and other parts of the United States, similarly in large masses. There is an article respecting it in the *Gardeners' Chronicle*, 1848, by Mr. Berkeley, in which it is mentioned that Dr. Macbride, who had examined and described it ("Linnean Society Transactions," vol. xii.), contested strongly its fungoid character. Analysed by Professor Ellet, of South Carolina University, it had been found to consist of nearly pure pectin; but whatever it may have proved to be botanically, Mr. Berkeley concludes by saying that tuckahoe is totally different from the native bread of Van Diemen's Land, which is clearly very closely allied to the common truffle.

Mr. Berkeley again returns to the subject; his paper is in the *Linnean Society's Journal*, vol. iii., 1858. Here he deals with two Chinese productions, of which he determines one to be nearly allied to *Mytilus australis*, and the other identical with *Pachyma Coniferarum*—tuckahoe, or Indian bread. The latter of these, as pointed out by Mr. Hanbury, who at the request of Mr. Berkeley had obtained information respecting their uses in China, is called foo-ling, and is largely made use of converted into cakes, which are considered to be both nutritious and medicinal; indeed, Professor Ellet had previously pointed out that tuckahoe was an antidote for some of the more active mineral poisons. The cakes are sold to the cry of "A hoo ka foo-ling ka" in the streets of Shanghai. The name "foo" or "fuh" is derived from fir tree, and the very finest specimens are called "fuh-shin," one of which, as big as a man's fist, if you hang it as an amulet round your neck, is so powerful that it will discomfit a hundred devils. Choo-ling is a somewhat

different production, and similarly it is nearly pure pectin; it is sold in the same way, but the name is not savoury, as it refers to pig's dung; but the Chinese are not particular. Unfortunately, Mr. Berkeley says but little light is thrown upon the real nature of these productions by all the information we possess. No fungus has ever been found on the American or Chinese tubers, and he comes to a similar conclusion with regard to the specimen above mentioned, allied to the native bread of Australia. "The internal substance is marbled like a truffle, but there is not a trace of fruit, and in consequence, together with *Mytilitta*, it must be considered of very doubtful affinity."

I had hoped to submit the results of further examination, but reasons with which the Honorary Secretaries are acquainted have prevented me doing more chemically than to repeat Professor Ellet's experiment affirmatively as to pectin. I have also observed microscopically that the crowded hyphæ have some tendency in places to form concentric rings, but I could discover no asci. The plant may be considered to be the mycelium or the sclerotoid mycelium of a fungus of which the other stages of growth have never yet been observed.

In the Museum of the Pharmaceutical Society is a specimen of another species, from Canada if I mistake not, *Mytilitta lapidescens*, the tubers of which are from the size of a walnut to that of a nut, equally hard and nearly black.

The PRESIDENT, in proposing a vote of thanks to Mr. Southall, said this specimen had been presented by Mr. Miller, of Hobart, Tasmania, who had been recently appointed Honorary Colonial Secretary in that part of the world, and it was therefore one of the firstfruits of their new colonial policy.

Mr. HOLMES said the *Mytilitta lapidescens* to which Mr. Southall referred came from Jamaica, and there had been an article in the *Gardeners' Chronicle* on it lately. With respect to the *Mytilitta australis*, he hoped their colonial friends would try and investigate the perfect state of this fungus, for there could be very little doubt it was a fungus in a very imperfect state. It had been one of the puzzles of fungologists for a great number of years, and it would be a great boon to them if they could obtain the life history of the plant.

Mr. ATKINS asked if this article were used as food at all, or was it regarded purely from the fungus point of view for its flavour,

or any other domestic culinary purpose. He should also like to know whether there were any superficial indications of its growth. One of the most interesting of the English fungi was the truffle, which showed no external indication, and in his own neighbourhood a particular breed of dog was kept for the purpose of finding it. The other day a gentleman who had been travelling in Japan told him there was a singular form of truffle found there, much larger than our own, which was also hunted for by a particular species of dog. That fungus he said was very prejudicial to health until it had been boiled, when it became a valuable element of food.

Mr. PLOWMAN said no account of any satisfactory investigation had been received from their colonial friends, but an explanatory letter only. As to its being cooked, it was stated in the paper that cooking produced but little change in its character; and if that were the case, it was hardly likely the natives would take the trouble to cook it. Mr. Miller said in his letter, "I can say little about the native bread, except that the aborigines of Tasmania were very fond of it, and considered it a delicacy. There is neither leaf, branch, root, or stem shown above ground, to indicate where it can be dug for successfully; but after rains the natives used to discover the spots by cracks of a peculiar nature in the surface, which indicated its locality."

Professor REDWOOD then took the chair whilst the President read the following paper,—

NOTE ON CERTAIN ANHYDROUS ESSENTIAL OILS.

BY JOHN WILLIAMS, F.I.C., F.C.S.

A few months back I had occasion to prepare some samples of a few essential oils in an anhydrous, and if possible colourless, condition. The specimens were required for certain optical experiments to which it is not necessary that I should further allude on the present occasion. Some of the results obtained in preparing them, however, appear to be sufficiently curious and interesting, from a pharmaceutical point of view, to justify me in bringing the subject before the Conference, and submitting samples of the products obtained for inspection.

The oils operated upon were the essential oils of orange, lemon, bergamot, organum, geranium, lavender, and peppermint.

These samples were obtained from a most respectable and reliable

source as of good commercial quality, and I have no doubt could be taken as fairly average samples of the best oils usually found in commerce. I assume also that they were quite free from anything in the shape of adulteration.

Under ordinary circumstances essential oils are distilled with the aid of water or in a current of steam, but as my object was to obtain "anhydrous" oils, it was evident that such a process could not be adopted. On the other hand, when essential oils are distilled over a naked gas flame or other similar sources of heat, there is great risk, indeed almost a certainty, of over heating, and the product consequently becoming contaminated with empyreumatic matter.

This difficulty was got over in a very simple manner by adopting a mode of procedure somewhat largely employed in our laboratory, with a slight modification for which I am indebted to my friend Mr. Miles Smith. The details you will perhaps permit me to occupy a few minutes in describing.

The process consists in employing a bath of fusible metal, and thus avoiding the possibility of the oil becoming overheated at any point.

The fusible alloy employed is composed of bismuth, cadmium, tin, and lead. It melts at 140° F., or far below the boiling point of water. It is true it is a rather expensive material when compared with ordinary solder, which is generally used for this purpose, but it presents the great advantage that there is little or no danger of the retort cracking when it is plunged into the melted bath, whereas with solder this danger is considerable.

The source of heat made use of is a Fletcher's or Bunsen's gas burner. The fusible alloy is contained in an iron basin into which the retort can be lowered or raised at will. No Liebig's condenser is required or advisable; for so high is the temperature at which these essential oils boil, ranging from 160° to 240° C. (320° F., 464° F.), and so easily condensible and so little dispersive are their vapours, that no water is required for their condensation. In fact, the end of the retort simply requires to be inserted for an inch or two inside a somewhat larger tube two or three feet in length; and with a flask at the end to act as receiver, the apparatus is complete. No cork or luting is required; simply a little soft paper wrapped round the joint will be found sufficient to keep in the vapour of the oil.

When an essential oil of the kind I have been experimenting upon is heated in the manner described, there first comes over a mixture of aqueous vapour and oil. This oil that first comes over boils at a comparatively low temperature, and although it is of a

M M

pleasant flavour, it can be easily distinguished from the true oil. It, however, does not occur in large quantity in any oil I have examined; the utmost, I think, would be from $\frac{1}{2}$ oz. to 1 oz. from a pound of natural oil.

After a time the neck of the retort is seen to clear from streaks and striæ, and the boiling point of the oil rises somewhat. It is then necessary to change the receiver, when a considerable quantity of the anhydrous oil distils over, generally amounting to quite one half, frequently more, of the oil operated upon. In fact, as a rule this portion is by far the largest fraction. I should mention that the boiling point is at no time constant or steady, but is continually although slowly, rising throughout the distillation. After a time the temperature is observed to rise more rapidly, when the receiver has to be again changed, as a quantity (comparatively small, it is true) of high boiling and coloured oil now passes over, the boiling point rising in many cases to 240° C., or upwards; on one occasion nearly 300° C. was reached, but that was not with one of the oils I am now directing your attention to.

It is not advisable to continue to apply heat beyond the point at which the high boiling oil comes over very slowly and in small quantity; for if that be done, white smoke-like clouds form in the retort, denoting that the point of destructive distillation has been reached. But if the process be stopped before that point is arrived at, a residue is left in the retort consisting of very curious and interesting resinous or oleo-resinous bodies, probably the products of oxidations of the natural oils. I wish to draw your attention to these bodies; possibly they have not been produced before in a state in which they could be examined, as by the ordinary mode of manipulation they would either be left behind in the water or be so changed by direct heat that their real nature could not be distinguished. The quantity of resinous matter produced varies very much with different oils; but as a rule it is much greater than I anticipated.

The anhydrous essential oils, to produce which was the main object I had in view, as obtained in the way described were slightly coloured, or became so after being kept a few days. To obtain them in a colourless condition it was found necessary to redistil them a second time, when with the exception of the geranium oil, which still came over slightly coloured, the whole were obtained in a perfectly colourless state. I may remark that upon the second redistillation of the anhydrous oils a little aqueous oil came over at first, proving that the oils obtained in the first redistillation were not

quite anhydrous. A little resinous residue was also left in the retort, but the amount was very small in comparison to that remaining after the first redistillation.

The samples on the table will, I trust, prove of interest to members. They consist of some of the pure anhydrous oil, the high boiling oil, and the residual matter left behind in the retort. This residue I have no doubt was contained in its present state in the original oil, and is not a product of decomposition.

The oil of orange yielded a large quantity of pure anhydrous oil, but little of higher boiling point, and a brown oily residue, not so offensive as some of the others.

The lemon oil yielded a large quantity of anhydrous oil. The residue was dark brown, and solid, but not offensive in smell.

Bergamot yielded a large quantity of pure oil. The high boiling oil was coloured and not pleasant. The residue was very dark coloured, but liquid, and very offensive in smell.

Origanum yielded a large quantity of pure oil. The residual oil was very dark coloured, more liquid than the bergamot, but not so offensive in smell.

Geranium oil turned out very badly. The pure anhydrous oil was comparatively small in quantity, and still coloured; the high boiling oil was in small quantity and not nice. The residual oil amounted to quite one half the original oil; it was very dark coloured and very offensive.

The original oil of lavender was of American origin. The amount of pure anhydrous oil obtained was smaller than from some of the other oils. The high boiling oil was very much coloured and not of pleasant flavour. The residual matter was nearly black, of the consistence of treacle, and very offensive.

The oil of peppermint was also American. It yielded about the same proportion of pure anhydrous oil as the oil of lavender. The high boiling oil was still distinctly peppermint, but coarse in flavour. The residual oil was light brown and thick; it was not so offensive as some of the other residues, but was very inferior to ordinary oil of peppermint in flavour.

With respect to the pure anhydrous oils there can be, I think, no doubt that a great improvement has taken place in their flavour. They will perhaps strike most persons as not being so strong as the original oils, but that, I think, is due to their having been deprived of the coarse—though probably powerful—smell of the high boiling oils and the residual matter. In fact, when the residual oleoresins are examined, I think it will be quite understood how the flavour of

the various oils must be improved by the removal of such crude and in many cases really offensive matter.

At present I do not know how long these anhydrous essential oils will keep,—that is, how long they will retain their superior qualities, if they have any,—or in what time they will again become oxidized and converted back into the state of the original oils. This I intend to try, by keeping samples of these anhydrous oils, and observing, if possible, their rate of change. I have an idea that it is likely anhydrous oils will keep for almost an indefinite time, and that the oxidation and change of these bodies is due to the presence of small traces of water. It would be a very important thing if we could devise a mode of keeping essential oils in good condition for at any rate some time, and I shall watch the results of keeping these samples with interest. Should I obtain any results of sufficient importance, I shall have great pleasure in making a further communication upon the subject at some future time.

Professor REDWOOD proposed a vote of thanks to Mr. Williams for this very interesting and in some respects very important communication. It was very interesting to him, not so much on account of the facts brought forward, as the prospects held out of the attainment of further results which might be looked for in connection with some of the essential oils.

Mr. DORT suggested that it was just possible that the temperature employed might have caused some decomposition, and asked Mr. Williams if it was attempted to distil the oils *in vacuo* in order to avoid the possibility of decomposition.

Mr. SCHACHT said if he were not mistaken this subject was investigated to a considerable extent by Dr. Tilden some years ago, and he had an impression in his mind that Dr. Tilden then succeeded in working out an important point with reference to many of these essential oils, some of which were included in Mr. Williams's list, namely, that they were not simple bodies, but that the majority, if not all, contained a hydrocarbon pure, and also a compound oil containing oxygen; and moreover, that these were to a considerable extent separable by distillation. He also believed that the opinion then expressed was that the odorous oils were chiefly those which contained oxygen, and it occurred to him as Mr. Williams was reading the paper that, valuable as many of the results were, one thing seemed to be wanting, namely, a reference to some definite moment at which the true essential oil was supposed to be coming

over. One of the series was oil of lavender, and he understood the boiling point was low at the first part of the process, and then gradually rose. Now, if it had been found that for any distinct period during the operation the temperature had been constant and the characters of the distillate for that period tolerably well marked, it might have been hoped that real oil of lavender was then coming over. That, however, did not appear to have been observed, and so the doubt remained as to whether the distillate was normal oil of lavender or some indefinite mixture of educts and products. As Mr. Williams thought the odour in some cases less strong in what he thought the best portion of his product, he would suggest whether it might not be possible, if the odorous principle belonged to the oxygen compound, that a change was taking place all the time, and that comparatively little of the odorous principle landed in what was termed the result, but that large portions were retained in the resinous and somewhat offensive product which was left in the retort.

Mr. PLOWMAN said Mr. Williams had shown a number of residues, but had alluded to them somewhat briefly. He should like to ask Mr. Williams if he had conducted any experiments to prove if these substances were brought over mechanically with the steam during the first distillation of the oils; if they were produced by oxidation by keeping, or if they were produced, as Mr. Schacht seemed to suppose might be the case, by the second process of distillation at high temperatures? This opened out a wide field for inquiry, but it would be useful if Mr. Williams would give some indication of his own opinion as to which of those three processes the presence of residue was due.

Mr. ELBORNE said it would be interesting to know the specific gravity of the distillate as compared with the original sample of oil taken. Essential oils were liable to great sophistication, which it was almost impossible to detect, and he believed that nearly all commercial samples of essential oils contained certain added substances of the nature of turpentine, which had been previously rendered entirely odourless.

Mr. WRENN said this paper appeared to confirm a considerable number of experiments in which he had himself engaged. He had lately redistilled the whole of the essential oils in an ordinary glass retort which was covered with asbestos. He had previously dried them with chloride of calcium: some made three separate distillations. He found the first always came over at a very low boiling point, and had a low specific gravity. The second one came over

at a higher boiling point, and had a higher specific gravity, and so on to the end. It was not always the first distillate which had the best aroma, or was most similar to the primary product. He always found a terpene odour prevailed in the first, but there was the true odour, more especially, in the second. The question had been asked, Did the colouring matter or the resinous matter arise from being carried over by the steam, or was it a product of oxidation? He had some samples which were perfectly colourless nine or ten months ago, and they remained so for four or five months, but they were gradually regaining colour. One had been submitted to redistillation two or three months ago, and this oil, which previously appeared to be entirely free from any resinous matter, was now exhibiting signs of resin gradually being formed. His opinion, therefore, was that it was due to oxidation, not altogether to the mechanical action of the steam. He would also ask how Mr. Williams arrived at the boiling point with which he had had some difficulty. He found an ordinary U-tube with mercury the best.

Professor REDWOOD said Mr. Schacht had called attention to the fact that some communications had been made on a former occasion on subjects allied to the one now brought forward. He regretted he could not recall the facts exactly, but his memory somewhat failed him in that respect, though he was quite conscious of the fact, and had had some little practical experience himself in attempting to produce some of these essential oils in a condition similar to that in which Mr. Williams had now obtained them, and by a process very similar. He had been in the habit of using a fusible metal-bath as an excellent means of ensuring a constant temperature considerably higher than boiling water, and had used this in the distillation of essential oils, more particularly oil of lemon. All who had had any experience of this oil must be aware that it was one the physical characters of which were liable to very great variation when kept for any length of time. In point of fact those who had to use it largely as a flavouring agent would very willingly indeed pay a large sum of money to any one who would indicate the means by which oil of lemon could be made to retain its natural odour as when first obtained in the usual way from the lemon. The best natural oil of lemon was obtained not by distillation, but by mechanical means, by which the oil vesicles were fractured and the oil pressed out from the lemon peel. Some portion was subsequently obtained by distillation with water, but that was not of the best description. Oil of lemon obtained by puncture had an

extremely fragrant odour, which it was incapable of retaining for any length of time; exposed to the air it lost that flavour and acquired an odour somewhat allied to oil of turpentine, so much so that many persons supposed that this essential oil had been adulterated with oil of turpentine where no such admixture had taken place; it was probably a molecular change which occurred. These essential oils consisted of a hydrocarbon and an oxidized oil, and the hydrocarbon had the same centesimal, but not the same molecular composition as oil of turpentine. It appeared to him that in any process such as that Mr. Williams had adopted, what was obtained really was, as Mr. Schacht had suggested, a product and not an educt. He might be asked where was the proof of that, and there he must be content to submit to the criticism which Mr. Naylor might apply, for he confessed he had not chemical evidence, but nevertheless he had a certain amount of physical evidence. If he took a sample of oil of lemon, such as persons engaged in the flavouring of jellies attached a high value to, and if that oil were submitted to distillation, two or three products were obtained. The original oil was not shown by Mr. Williams, but there was a distillate obtained at the lowest temperature, one obtained at the highest, and a residue. The first thing he observed was that no one of them had the flavour of the original oil of lemon, nor did it approach it in fragrance and sweetness; and in fact the residue was rather disagreeable in odour, and none of the others could be used as flavouring agents. His acquaintance with distilled oil of lemon commenced a great many years ago, and he remembered when a house in Bond Street used to sell an article for the removal of grease stains from ladies' dresses, which on being examined was found to consist of oil of lemon with alcohol and a little camphor. Now taking the oil in its original condition, that would not answer the purpose, because there was resinous matter, and it would have left, when volatilization took place, a stain worse than the original one, and distilled oil had to be used. Now these products of distillation were none of them at all comparable with the original oil, nor from all of them together could what was started with be reproduced. The distilled oil was not equal to the original oil; and if what was left in the retort were added to it, instead of making it better, the residue made it much worse. He thought therefore it was quite obvious that there were chemical changes taking place in the process of distillation which materially affected the physical characters of the oil. The same thing applied to other essential oils, though he had worked more upon oil of lemon than others. Here was a subject

for much further research, either by Mr. Williams himself, or, if he were too much occupied, as he probably was, it was a fine subject for some young chemist to take up and show how the essential oils, especially such a one as oil of lemon, could be rendered permanent without being destroyed by a process of distillation. Such processes had been suggested, and he was not sure that Dr. Tilden himself did not communicate a method of dehydrating these essential oils without submitting them to distillation. It appeared from some experiments made, that if oil of lemon were dehydrated by some such body as chloride of calcium, it would be much more permanent, and would retain its flavour much longer than would otherwise be the case. He could not sit down without again expressing to Mr. Williams great indebtedness, not only for this paper, but for the address at the opening of the meeting, for which he thought he had been but very inadequately thanked.

Mr. WILLIAMS, in reply, said the object of his little note had been somewhat misunderstood. It was not a research, and he did not call it a paper. He simply had a customer who wished him to produce a certain number of essential oils which would be anhydrous and colourless, and which were intended for certain optical experiments. Most of the work was done before he thought of bringing this note before the Conference, and it was only as a kind of after-thought it occurred to him that it might be interesting to show these results. That was why he could not give what Mr. Dott would like, the ranges of temperature. All they did was to keep a thermometer in the retort, and notice that the temperature rose in accordance with what was stated in all chemical books respecting these oils, but he had not attempted to make any research on the nature of the oils, for which, in fact, he had not time. Professor Redwood had referred to the oil of lemon, which was a very interesting oil and perhaps the weakest example in his argument. When he produced oil of lavender and produced the residue which was left in the retort, if they believed the residue was contained in the original oil, which was a very good oil, was not that enough to account for the commercial oil not being so fine in flavour as they would like it to be? It was quite an open question, and in fact was what he wanted to ascertain, whether these residues were contained in the oils or were produced during distillation? The pure anhydrous oils had been twice redistilled. The residue had been separated during the first distillation. The second distillation only yielding traces—not in most instances sufficient for weighing. The high temperature necessary for distilling the

oils might have acted upon some oxidized product in the original oil to produce the oleoresins exhibited, but the mere high temperature evidently did not produce such products from the pure oils alone. The distillation having been conducted under the circumstances he had mentioned would almost lead one to suppose that the residues were really contained in the original oils; but he could not say he was certain on that point. Of course he was aware of Dr. Tilden's researches, and it must not be supposed that he in any way attempted to supplement that work. It was perfectly certain the oils were not homogeneous, and the fact of the thermometer rising continuously, and there being no fixed boiling point, was sufficient to demonstrate that. His real reason for bringing these samples was on account of these residues, which, he thought, had probably not been seen before, for they were generally thrown away and destroyed. He quite agreed with Professor Redwood's remark that mixing the three together would not produce the original essential oil of lemon, but something very different, and, therefore, a change had occurred. He originally thought he would bring the light oil which came over first, and also a sample of the original oils, but for a note of this sort he thought it was hardly worth while. He only wished to show what he might call purified anhydrous oil, that which came over last, which was found very peculiar in the smell, and the residue of which was frequently very offensive. He had not taken the specific gravities. With regard to drying with chloride of calcium, he might say they had tried distilling with quicklime, but did not get the result they wanted, namely, anhydrous colourless oils. They found also that quicklime did not give such a satisfactory result as distilling the oils by themselves. Oil of orange was one of the first tried, and they distilled that with lime; but he considered the product was certainly more offensive than when distilled by itself.

The Conference then adjourned for luncheon.

The chair was again taken by the President at half-past twelve, when the following paper was read by Mr. Benger:—

TINCTURE OF QUININE. .

By R. WRIGHT,

Pharmaceutical Chemist.

The above preparation is a very important one, seeing that it offers to the medical practitioner a concentrated solution of the

alkaloid quinine in a neutral condition, the latter a by no means unimportant desideratum in some diseases.

The question has often arisen and been discussed, as to whether it is the best solution of the kind which it is possible to obtain, and especially as to whether a tincture of greater uniformity of strength cannot be prepared.

The object of the present paper is to discuss this question, to investigate the causes of the variation in strength of commercial samples of tincture of quinine, to give the results of the analysis of a number of samples of the tincture ordinarily sold by retail chemists and druggists, and to suggest means whereby the great desideration of uniformity of strength may be secured.

The process whereby tincture of quinine is prepared differs from that of every other tincture, except *tinctura ferri acetatis* and *tinctura quiniæ ammoniata*, in that it is not a merely physical process of solution or extraction, but one which involves chemical decomposition as well.

Every pharmacist who prepares his own tincture of quinine is aware of the fact that when the sulphate of quinine comes into contact with the calcium salts derived from the orange peel, a double decomposition takes place, part of the sulphuric radical combining with the calcium, and, *pari passu*, an organic salt of quinine probably going into solution.

That this is so was first pointed out by Mr. Groves, in the discussion on a paper on "Tincture of Orange," read by the late Mr. Haselden, at an evening meeting of the Pharmaceutical Society (*Pharm. Journ.*, iii. 361).

The opinion then advanced by Mr. Groves has since been confirmed by many observers, who have proved conclusively that the precipitate produced in the preparation of the pharmacopœial tincture of quinine consists solely of calcium sulphate, free from both tannin and alkaloid.

An approximate estimation of the amount of calcium salts present in orange peel was made from carefully dried samples of peel.

As the opinion had been expressed more than once by correspondents in the *Pharmaceutical Journal* that the lime salts existed mainly or entirely in the inner portion of the peel, this was carefully separated from the outer portion, and each estimated separately.

In each case two estimations were made, and the percentages subjoined indicate the mean of the two concordant results.

		Percentage amount of Ash			Soluble in Water.		Insoluble in Water.
Inner	.	4.8	.	.	2.5	.	2.3
Outer	.	6.5	.	.	3.25	.	3.25

The results show that the outer portion of the peel is the richer in calcium salts, corresponding with my experience, which is that the best tincture of orange (i.e., the tincture made exclusively from the outer portion) yields also the best tincture of quinine.

The portion of ash insoluble in water dissolved with effervescence in dilute hydrochloric acid, indicating that the calcium exists in the peel in combination with an organic acid.

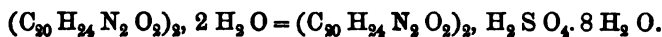
The next point which it was sought to settle was the solubility of sulphate of quinine in proof spirit. The latter was made by diluting rectified spirit of wine with distilled water, until, at a temperature of 60° F., it had a specific gravity of .920.

Two series of solutions were first made, one from a commercial sulphate of quinine labelled B.P., the other from that manufactured by Messrs. Howard & Sons, Stratford.

The solutions in each series contained respectively, 7, 6½, 6, 5½, and 5 grains of sulphate of quinine in 1 fluid ounce of proof spirit, and were made by digesting the mixtures contained in well-corked bottles, in water at about 150° F., shaking occasionally till a clear solution was obtained. They were then set aside in a cupboard where the temperature remained moderately constant at about 60° F. It was then remarked that the solutions in each series which contained 7, 6½, and 6 grains showed signs of crystallization, those containing 5 and 5½ grains remaining clear. This seemed to fix the degree of solubility between the limits of 5½ and 6 grains in the ounce. For the more exact determination of the solubility the following method was adopted.

An excess of sulphate of quinine was allowed to digest in proof spirit for several days, at a temperature of about 60° F., the mixture being occasionally shaken.

A fluid ounce of the saturated solution was taken. To this 10 drops of dilute sulphuric acid were added, and the mixture evaporated over a water-bath to drive off spirit. The aqueous solution was then allowed to cool. When cool 20 drops of liquor ammoniæ, B.P., were added, and the mixture shaken up with two successive portions of ether. The two ethereal solutions were mixed, evaporated to dryness in a tared dish, the residue weighed, and the amount of quinine sulphate calculated from the equation:—



Four estimations were made, two with each sample of the sulphate above mentioned, and the results came out almost exactly concordant, the mean solubility being 5·7 grains sulphate of quinine in one ounce of proof spirit.

The question now arose as to whether the limit of solubility was ever approached in tincture of quinine.

This was solved by calculating from the amount of calcium sulphate obtained in making tincture of quinine. The first calculation is based upon results obtained by myself, the second on those placed on record by Mr. Butt (*Pharmaceutical Journal* [3], ix. 910).

1. From 4 pints tincture of quinine, 28 grains anhydrous sulphate of calcium were obtained.

Supposing $\text{CaSO}_4 = (\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2)_2 \cdot \text{H}_2\text{SO}_4 \cdot 8\text{H}_2\text{O}$, or 136 grains calcium sulphate = 890 grains quinine sulphate;

Then 28 grains sulphate of calcium represents 183 grains sulphate of quinine, leaving, of undecomposed sulphate of quinine, 457 grains, or 5·7 grains in each ounce of the tincture.

2. From 16 pints and 8 ounces tincture of quinine, Mr. Butt obtained 90 grains calcium sulphate. This represents 588 grains quinine sulphate, and leaves 2,036 grains undecomposed, corresponding to 6·3 grains in each ounce. Thus we see, that although at the normal temperature the solubility of sulphate of quinine in proof spirit is only 5·7 grains in an ounce; in tincture of quinine we have a variable quantity of undecomposed sulphate, the amount, in the cases cited above, being in one instance 5·7, and in the other 6·3 grains in the ounce.

What are we to infer from this? Obviously, that unless an abnormal proportion of organic calcium salt be present in the tincture of orange employed (and hence in the orange peel from which this was prepared), the quantity of undecomposed sulphate of quinine present in the resulting tincture of quinine will be so great that in cold weather a portion of it will inevitably crystallize out. This fact was brought very strikingly before my notice the other day, when, on examining the four pints of tincture upon which the above mentioned calculation is based, and which, after being made, was placed in a cold cellar, where the temperature of late has frequently ranged as low as 40° F., I noticed that some light, feathery crystals of sulphate of quinine had already separated. Yet this had been very carefully prepared, and from a tincture of orange made by myself, proof spirit of full strength being employed.

From the above consideration it appears certain that however carefully tincture of quinine is prepared, it is quite a matter of

chance as to whether or not the quinine will all remain in solution.

It was next attempted to solve the question as to what is the organic acid which exists in orange peel in combination with calcium. Many unsuccessful attempts were made before a process was devised by which the acid could be isolated. The great difficulty lies in the fact that it is almost impossible to separate the calcium salt from the glucose and tannic and mucilaginous matter with which it is associated in the peel.

The following process, however, was found to answer well:—The peel was reduced to a coarse powder, and exhausted by maceration and percolation with a methylated spirit of proof strength. The spirit was recovered by distillation. To the dark coloured aqueous extract thus obtained plumbic acetate was added till tannic and astringent matters were removed. To the clear filtrate, absolute alcohol was added very cautiously, till a slight turbidity was produced. On setting the mixture aside for a few hours, a copious precipitate settled. This was collected on a filter, washed with spirit, then dissolved in water to which a little acetic acid had been added, and the solution precipitated by basic acetate of lead. The precipitate was filtered off, well washed with spirit, and afterwards mixed with water. It was then decomposed by passing sulphuretted hydrogen through the mixture. This was filtered, and the resulting almost colourless acid liquid evaporated to a low bulk over a water-bath, and finally over a dish of sulphuric acid under a bell-jar to dryness, when the acid was obtained in small crystals. These were found to possess the characters and answer to the tests of citric acid, and there is no doubt in my own mind that the organic acid which exists in combination with calcium in orange peel is citric. Probably it exists there as an acid citrate.

The examination of a number of trade samples of the tinctures of orange and quinine was next undertaken; the results of which are shown in the table on page 543.

The object in view in regard to tincture of orange was to ascertain whether trade specimens contained the full proportion of spirit, a question which has an important bearing upon the stability or otherwise of a tincture of quinine made from it.

In estimating the amount of quinine sulphate in the tincture, the process employed was the one previously mentioned; the results also were calculated from the data there given. In the case of Nos. 7–38, a sample of each tincture was procured from the same house, and in the case of the first six, which were made by myself from

different samples of peel, the tincture of quinine was prepared from the tincture of orange opposite which it is found in the table.

It will be noticed that the percentage amount of alkaloid in *some* of the tinctures comes out rather high. This arises from the difficulty experienced in obtaining the hydrous quinine free from the colouring matter of the tincture of orange. The results generally may, however, be taken as approximately correct:—

The main deductions to be drawn from the table are:—

1. That when carefully prepared, the specific gravity of tincture of orange will be from .930 to .934, and should not be higher than .940. It will be seen that three-fourths of the samples examined fall within the limits indicated.

2. That whereas tincture of orange is always more or less acid, tincture of quinine, if free from added acid, will always be neutral to test paper.

3. That the specific gravity of tincture of quinine prepared from a tincture of orange of full alcoholic strength will be about .934, and should not be higher than .945.

4. That notwithstanding the fact that by the process at present official it is impossible to obtain a stable and uniform tincture of quinine; nevertheless, in the great majority of cases the alkaloidal strength approximates very nearly to the pharmacopœial standard, viz., 8 grs. sulphate of quinine in a fluid ounce.

The practical question remains—How are we to obtain a tincture of quinine which shall fulfil the conditions laid down at starting as regards neutrality, degree of concentration, and uniformity in alkaloidal content?

Three substances have been tried, viz., freshly precipitated quinine, the so-called neutral or “soluble” sulphate, and the hydrochlorate.

With regard to the first of these, the process is difficultly workable, and the fact that the quinine separates out on diluting such a tincture with water is a fatal bar to the adoption of the process.

With regard to the neutral sulphate, the same objectionable precipitate of calcium sulphate forms as is the case with the official sulphate.

The hydrochlorate, however, answers admirably, and fulfils all the requisite conditions. It is easily soluble in tincture of orange, no precipitation takes place, and the solution remains stable.

The suggestion that in the next edition of the National Pharmacopœia this salt should be made official for the preparation of

Table showing Specific Gravity, etc., of samples of Tincture of Orange and Tincture of Quinine.

TINCTURE OF ORANGE.			TINCTURE OF QUININE.			
No.	Reaction.	Specific Gravity.	Reaction.	Specific Gravity.	Hydrous Quinine. Grains per oz.	Quinine Sulphate. Grains per oz.
1	Acid	·930	Neutral	·934	6·2	8·1
2	Acid	·980	Neutral	·934	6·1	7·9
3	Acid	·930	Neutral	·934	6·4	8·3
4	Faintly acid	·934	Neutral	·938	6·0	7·8
5	Acid	·930	Neutral	·934	6·0	7·8
6	Acid	·934	Neutral	·938	6·5	8·4
7	Acid	·958	Neutral	·942	6·5	8·4
8	Faintly acid	·922	Acid	·934	6·5	8·4
9	Faintly acid	·922	Neutral	·926	6·2	8·0
10	Acid	·930	Acid	·934	6·0	7·8
11	Acid	·942	Neutral	·942	6·4	8·3
12	Slightly acid	·927	Slightly acid	·930	6·4	8·3
13	Acid	·930	Acid	·934	6·2	8·0
14	Slightly acid	·930	Neutral	·950	5·8	7·5
15	Slightly acid	·950	Very acid	·943	2·3	3·0
16	Slightly acid	·942	Acid	·933	5·0	6·5
17	Slightly acid	·934	Very acid	·967	3·8	4·9
18	Acid	·942	Neutral	·933	·8	1·0
19	Slightly acid	·927	Very acid	·937	4·4	5·7
20	Acid	·942	Neutral	·955	6·0	7·8
21	Acid	·930	Very acid	·959	Cinchonidine	
22	Slightly acid	·927	Acid	·930	5·7	7·4
23	Acid	·927	Slightly acid	·934	5·5	7·2
24	Acid	·942	Slightly acid	·942	5·8	6·8
25	Slightly acid	·930	Neutral	·938	6·2	8·1
26	Slightly acid	·925	Neutral	·938	6·4	8·3
27	Slightly acid	·930	Neutral	·934	5·6	7·3
28	Slightly acid	·938	Neutral	·931	4·8	6·2
29	Slightly acid	·934	Neutral	·942	6·0	7·8
30	Slightly acid	·938	Neutral	·942	5·8	7·5
31	Acid	·950	Neutral	·967	6·4	8·3
32	Acid	·971	Acid	·950	6·9	2·5
33	Acid	·930	Neutral	·934	6·4	8·3
34	Acid	·950	Neutral	·950	5·6	7·3
35	Acid	·942	Very acid	·932	6·2	8·1
36	Acid	·936	Acid	·932	6·0	7·8
37	Acid	·958	Very acid	·934	6·4	8·3
38	Acid	·922	Neutral	·950	6·0	7·8
39	—	—	Very acid	·967	3·8	5·0
40	—	—	Neutral	·938	6·4	8·3
41	—	—	Neutral	·938	6·2	8·1
42	—	—	Neutral	·963	6·1	8·0
43	—	—	Neutral	·946	5·0	6·5
44	—	—	Neutral	·957	6·1	8·0

tincture of quinine is not an original one. It was first suggested by Mr. Whitfield (*Pharm. Journ.*, viii. 440), and again by Mr. Martindale (*Pharm. Journ.*, ix. 407). The experiments made by myself enable me fully to support their recommendations.

The PRESIDENT, in moving a vote of thanks to Mr. Wright, said the results he had arrived at were well worthy of attention. The fact that the hydrochlorate of quinine was better suited for making the tincture than any other salt was corroborative of what had been found by other investigators, and it was quite what he should expect from consideration of the chemical properties of the salts. If the orange peel contained lime, which it certainly did, and Mr. Wright had proved that it was contained in the outer part of the rind much more abundantly than the inner, it was evident that the using of a salt of quinine which would not be affected by the lime naturally contained in the orange peel was very important.

Mr. MARTINDALE said he could corroborate what the author had said in the paper. The only other salt which could be used was the hydrobromate, which in some respects was better than the hydrochlorate. He hoped that in the future Pharmacopœia, either the hydrochlorate or the hydrobromate would be introduced, for they were both useful salts for dispensing purposes.

Mr. BORLAND said he remembered some years ago a statement being made in the *Journal*, that if proof spirit were used of the proper strength there was no difficulty in preparing tincture of quinine according to the Pharmacopœia; but he certainly could not corroborate that statement, and entirely agreed with what was stated in the paper, that sulphate of quinine used with the tincture of orange would sometimes throw down a copious precipitate, let the strength of the spirit be what it might. For some years past he had used hydrochlorate of quinine with great advantage.

Mr. BENDER said the author pointed out that proof spirit would dissolve only about 5·7 grains of sulphate of quinine to the ounce, and that it was a salt of lime, which existed principally in the outer portion of the orange peel, which separated the remainder of the quinine from the sulphate, and enabled it to dissolve in the tincture. If the tincture were made with rectified spirit instead of the tincture of orange peel, the proper quantity of sulphate of quinine would not be dissolved.

The following two papers were then read by Mr. Plowman :—

NOTE ON CHINA BICOLORATA, OR "TECAMEZ BARK,"

WITH SUGGESTIONS AS TO ITS PROBABLE BOTANICAL ORIGIN,
AS INDICATED BY ITS
BOTANICAL, CHEMICAL, AND MICROSCOPICAL CHARACTERISTICS.

BY JOHN HODGKIN, F.I.C., F.C.S.,

*Mem. Soc. Chem. Industry ; Medallist in Chemistry, University
College, London.*

An opportunity has lately been afforded me of investigating this most interesting bark, of which after the lapse of many years a small consignment has recently appeared. But before giving the results of my examination, it will be interesting to recapitulate and epitomize the information that has been published in various journals and handbooks since its discovery.

In the first place, then, this bark comes from Tecamez, or Atacamez, which lies west of Ibarra, on the western declivity of the Cotacacha, in Ecuador.* Here it was discovered in 1793 by Dr. D. Brown, a ship's surgeon, and a description of it, with an illustrative plate, was duly published in Lambert's "Description of the Cinchona Genus," 1797 (f. 30, tab. ii.). It appears to have been recommended as a useful tonic in a medical work published in 1824, by Dr. Brera, of Padua. Having thus attracted attention, it was submitted to a careful examination by MM. Pelletier, Pétroz, and Vanquelin, and their elaborate report appears in the *Journal de Pharmacie* for Oct. 1825 (pp. 449-462). M. Pelletier states that 100 parts contain 16 parts soluble in alcohol, of which 14·65 is "bitter substance" and 1·35 "resin," but they were unable to find any quinine, in which opinion they have been confirmed by Pfaff Von Santen and others, and still later Dr. Hesse, who states† "that it is altogether destitute of alkaloids." Gobel and Kunze ‡ give an illustration and a good description of the bark (to which I shall allude later on), and state that Humboldt saw the tree from which the bark is obtained, and was of opinion that its botanical origin was to be sought amongst Cinchonas or Exostemmas, in which

* Clements R. Markham, C.B., F.R.S., etc., "The Cinchona Species of New Granada," 1867, p. 104.

† Vide "Pharmacographia," 1874, p. 321. Flückiger and Hanbury.

‡ "Pharm. Waarenkunde," 1827-29, i. p. 84. Tafel xii., figs. 6 and 7.

opinion M. Weddell* tentatively coincides, and whilst Guibourt† is of opinion that it is a *Stenotomum*, Markham‡ thinks it is probably a *Pinkneya*. Now I propose to attempt to demonstrate by a chain of evidence from different sources, microscopical, botanical, and chemical, that there is a greater probability in its being a *Remijia* than any of the above-mentioned species. It is best first of all to describe the bark, and to do this I cannot do better than give Goebell and Kunze's description with slight amplifications where necessary. "The 'Pitoya' bark," as they term it, "comes in rolls 4 to 24 inches long, sometimes singly, sometimes many times rolled, and occasionally rolled together. The outer surface is smooth, and extremely finely wrinkled in the direction of the length, sometimes more so, sometimes less so, of a brownish or greyish yellow, with white or grey patches, occasionally spiraliform, encircling the quills, and generally the bark is studded with little warts. The interior surface is smooth, generally of a brownish black colour; occasionally, however, pieces are to be met with of a reddish brown colour. The Pitoya bark is composed of three portions: (1) The epidermis; (2) the orange-coloured bark; (3) a thin layer of fibre (*Bastlage*). The lower black surface, which is scarcely $\frac{1}{10}$ of a line in thickness, can be removed by a knife, on soaking the bark, and is composed of fibre. The diameters of the quills range from 4 lines to $1\frac{1}{2}$ inch (*Zoll*), and the thickness from $\frac{1}{4}$ to $1\frac{1}{2}$ lines. One never finds flat pieces, the least so which I have hitherto seen were still feebly bent inwards. The cross fracture is only slightly uneven, the longitudinal fracture is harsh, and often somewhat short splintering. The taste is disagreeable and intensely bitter, strongly inducing saliva. Of odour I could distinguish nothing. The bark yields a fine cinnamon-coloured powder."

Thus says Kunze,§ and his description certainly does not leave much to add. I would, however, remark that the sample I had was not so elegantly rolled, and appears to have been removed with less care. Some pieces have a whitish "coat," somewhat loosely attached to the bark, which, as it curls up in drying, looses this epidermis in transverse stripes, giving a somewhat "zebra" appearance. Some of the larger pieces on the interior present rather a remarkable appearance, longitudinal fissures, at an equal distance, having been caused by the drying of the evidently somewhat

* "Hist. Natur. des Quinquinas." Paris, 1849, p. vii.

† "Hist. des Drogues," iii. (1869), 190 (*Quinquina Bicoloré*).

‡ "Chinch. Species, N. Granada," p. 104.

§ Goebel and Kunze, "Pharm. Waarenkunde," Eisenach, 1827, vol. i. pp. 84-86.

"fleshy" bark. Such pieces are, however, the exception rather than the rule, as by far the greater portion dries with the smooth dark-coloured interior. The microscopical section of the bark, Dr. A. Vogl* has pointed out, closely resembles that of *Remijia pedunculata*, and he gives drawings of these two sections for comparison, and certainly there is a very striking analogy. Vogl does not offer any suggestions as to the real origin, but simply notes the fact of the resemblance to "cuprea;" but Humboldt, who actually saw the tree, was of opinion that it belonged to the *Exostemmas* or *Cinchonas*. But be it borne in mind that at that time this latter group included the *Remijias*, which were not then so perfectly understood as they are to-day. In Lambert's illustration of the leaves of the Tecamez bark, the leaves are seen to be of a peculiarly pointed form, closely tallying with the form of the leaves of *Remijia pedunculata*, as given in Karsten.† We have thus microscopical and botanical evidence from undoubtedly trustworthy sources which when noticed in conjunction, and I believe that they have not hitherto been noticed together, are rather suggestive of the possibility of the Tecamez bark being a *Remijia*. Now I am, through a fortunate concatenation of events, enabled to offer such fresh additional evidence as I think will materially tend to strengthen, if not absolutely confirm, this hypothesis.

In the first place, then, I must mention that among the numerous importations of "cuprea" bark, there has come occasionally a small parcel of a "cuprea" of very different appearance to the ordinary *R. pedunculata*. The bark is of a much more orange-red, instead of the dull lake of the ordinary "cuprea bark" of commerce; it comes in very thin, broken quills, or small pieces, and gives almost the appearance of cuprea "shavings." The bark is of fine quality as regards its percentage of quinine. It comes from the State of Tolima (Colombia), and is cut from trees which are very sparsely found, and thus far it does not appear that a large supply will come from that district. It is shipped from Barranquilla, like all bark of the same description. It is evident, from a careful examination of some hundredweights of this bark, that the tree is a small one in comparison with the *R. pedunculata*, and the pieces seem relatively but little larger than the *China bicolorata*, to which, with the exception of the colour, it bears a strong family likeness. In fact this bark, the scientific name of which I am unaware of, seems

* Dr. A. Vogl, "Beiträge zur Kenntniss der sogenannten falschen Chinarinden." Wien, 1876, p. 11.

† Flora Columbica, etc. Berolini, 1856.

to stand almost midway between *China bicolorata* and *R. pedunculata*. The exterior surface is, it is true, a great deal more longitudinally wrinkled; the interior surface is very similar.

Secondly, then, I must state that my analysis of the *China bicolorata* entirely contradicts the experience of previous observers; for not only does the bark contain 0.75 per cent. of alkaloids, but they are cinchona or remijia alkaloids. The bark contains also chinovine and chinic acid, which I obtained in the characteristic lime salt, and identified; the mother-liquor of these crystals smelt strongly of the peculiar odour of "Almaguer bark." The actual analysis is as follows:—

Quinine Sulphate	0.84 per cent.
= Quinine	0.255 "
Cinchonidine	—
Homoquinine	—
Cinchonine	0.06 "
Quinidine.	0.05 "
Amorphous Alkaloids	0.39 "

The quinine was carefully identified by the usual tests. Homoquinine or cinchonidine I was unable to find, but the absence of this latter alkaloid is negative evidence in favour of the Remijia theory. To summarize, we have then the following facts:—(1) *Microscopical*: The evidence of Vogl as to the great analogy of the *China bicolorata* and *Remijia pedunculata* sections. (2) *Botanical* (a) Humboldt's classification amongst the Cinchonas (which then included Remijias) or Exostemmas (this latter theory is now definitely abandoned on account of important botanical dissimilarities since recognised, e.g., the shape of the flowers, etc., etc.); (β) Lambert's evidence as given in his drawings of the leaves, which bear such a strong resemblance to Karsten's *Remijia pedunculata*; (γ) the "family likeness" between the above-mentioned rare Tolima *Remijia* and the *China bicolorata*. (3) *The Chemical evidence*: The presence of alkaloids which hitherto have only been found in either Cinchonas or Remijias.

From this evidence, drawn from so many sources of so distinctive a character, there can, in my humble judgment, be only one conclusion; namely, that the "*China bicolorata*" is in reality a true *Remijia*, and I, therefore, suggest for the consideration of professional botanists and quinologists, whether it would not be well that it should no longer occupy a position of "greater freedom and less responsibility" under the vague term, "*China*,"* but that it

* The synonyms for this bark are many, viz., *China bicolorata*, *China Pitoya*,

should boldly assume its botanical "responsibilities," and be known henceforth as "*Remijia bicolorata*."

ANALYSES OF SOME OLD CINCHONA BARKS.

By DAVID HOOPER, F.C.S.

Among a number of cinchona barks I have recently had occasion to analyse, the results obtained from four samples of an authentic source appear worthy of publication. These barks were some which had been given by Mr. McIvor, the late superintendent of the Madras plantations, to Dr. de Vrij, in the year 1874. Dr. de Vrij, in handing them to me for analysis, remarked that he had had them by him since that time, but no opportunity had presented itself for verifying the statements made on two of the packages.

Each sample was carefully marked in Mr. McIvor's own handwriting, with the following description :—

1. Mossed bark of *Cinchona officinalis*. Contains no quinine.
2. Renewed bark of *C. officinalis*. Contains no quinine.
3. Renewed bark of *C. officinalis*, var. *Uritusinga*.
4. Renewed bark of *C. pubescens*.

The specimens were in thick single and double quills, but their physical characters were not deemed worthy of exact scrutiny. They were all in a good state of preservation.

They yielded respectively 9·9, 9·5, 9·5, and 9·7 per cent. of hygroscopic moisture at 100° C., and gave, on analysis, the following alkaloidal composition.

	1.	2.	3.	4.
Quinine	0·84	—	2·04	4·18
Cinchonidine	1·13	—	2·44	1·53
Quinidine.	0·46	1·99	0·98	0·06
Cinchonine	0·71	0·68	0·99	0·49
Amorphous	1·88	2·90	0·53	0·77
Total	5·02	5·57	6·38	6·98

The No. 1, although not so bad as described, is much poorer than one would expect from an *officinalis*. No. 2 is peculiar in the large

Ch. Tecamez, Ch. Atacamez, Pitoya bark, Tecamez or Atacamez bark, China bicoloré, Zwei farbige China, etc., etc.

amount (2 per cent.) of quinidine it contains. Mr. J. C. B. Moens, in "Kinacultuur in Azië," records 1.2 per cent. as the maximum quantity of quinidine in several estimations of this species, and that he found in the root-bark. Quinidine in such amount occurs in a variety of *Ledgeriana* bark, to which the name *Quinidifera* has been applied, and Dr. de Vrij has found in some Java plants of *C. Calisaya* a few yield over 2 per cent. The amorphous alkaloids in bark No. 2 are also remarkably high. The fourth analysis indicates a very satisfactory yield of alkaloid, both in total amount and in quantity of quinine. It agrees substantially with the analyses of *C. pubescens* made by Dr. Paul in the early part of this year, notwithstanding the interval of about ten years between the times of collection. I have heard, on good authority, that *Cinchona pubescens* is a fast grower and fairly constant in alkaloidal contents. Several cuttings have recently been planted in the Nilgiris, and the result will be looked forward to with some interest. Among the large number of cinchona barks that will be candidates for a place in the new Pharmacopoeia, the *pubescens* species certainly possesses many recommendations in its favour.

In conclusion, I must express my obligations in being allowed to conduct the above analyses in the laboratory of Dr. W. F. Koppeschaar, in the Hague.

The PRESIDENT, in proposing a vote of thanks to both these gentlemen, said Mr. Hodgkin was himself connected with one of the most important quinine manufacturers in the country, and therefore any communication from him was of great interest, apart from its own intrinsic value. He was connected with the firm of the late Mr. Eliot Howard, a highly respected contributor to the Conference and to the Pharmaceutical Society.

Mr. NAYLOR asked if Mr. Hooper's paper contained any details of the method employed for estimating the alkaloids.

The PRESIDENT said he did not go into details.

Mr. ELBOURN said the former paper was one of considerable importance. He should like to know whether this Tecamez bark was imported in large quantities, and whether it closely corresponded to the modern cuprea bark which, as at present imported, was, he believed, considered to be afforded by two species of *Remijia*, the *R. pedunculata* and the *R. Purdieana*. This paper tended to show that cuprea bark was afforded by a third variety, which the author proposed to call *R. bicolorata*. Another question which

occurred to him, was whether this bark came from the same part of the world as ordinary cuprea bark, which he believed came from the region of Bucaramanga and certain tributaries of the Orinoco.

Mr. PLOWMAN, in reply to Mr. Elborne, said from one of the statements in the paper it appeared that this was not a common article of commerce. It came from Tecamez, which was on the western declivity of Cotocacha, in Ecuador. This was not very distant from the Orinoco, so that practically the geographical source might be said to be fairly identical.

The following paper was read by Mr. Benger :—

SESAME OIL AS A BASIS FOR LEAD PLASTER.

By THOMAS MABEN,

Pharmaceutical Chemist.

At the last meeting of the Conference two reports were submitted with reference to the suitability of sesame oil for pharmaceutical purposes. The conclusions arrived at by the writers, Mr. Conroy, F.C.S., and myself, were for the most part very similar, the only exception being that Mr. Conroy found the oil unsuitable as a basis for lead plaster, whereas my experiments had led me to form an opposite opinion.

The feeling of the meeting seemed to be in favour of Mr Conroy's position, but the question was by no means finally settled; and as it is of considerable importance, even apart from its pharmaceutical aspects, I have ventured, at the risk of being thought troublesome, again to take it up, in the hope of being able to make clear what is at present somewhat doubtful.

Mr. Conroy found that lead plaster prepared with sesame oil, in B.P. proportions, was dark in colour and much too soft. In my paper, I remark that the plaster can be prepared with seassame oil, provided we employ a larger proportion of lead oxide than is ordered by the Pharmacopœia; so prepared, it is darker in colour, less friable and more adhesive than the official plaster. In the discussion that followed the reading of the reports, Mr. Conroy's conclusions were confirmed by Mr. Tanner, who added that his own experience was that the plaster had the further disadvantages of a disagreeable odour, and when spread a tendency to become rancid. Having prepared many samples of sesame lead plaster before writing my paper, I was not at all surprised to hear that when the B.P.

proportions were adhered to, the result was bad alike in colour, consistency, and odour. So far, then, I am quite at one with both Mr. Conroy and Mr. Tanner.

The reason why the plaster should be so soft is to be found in the very large percentage of olein in the sesame oil. This was Mr. Conroy's explanation of the fact, and it seems to me to be the only explanation possible. Owing to the lead oxide not being in sufficient quantity to saponify all the oleic acid, a certain proportion of the latter is always present in the free state, and this evidently accounts not only for the softness, but also for the rancidity. It is, therefore, only natural to expect that by increasing the proportion of base as much as is necessary to ensure complete saponification, there would be no difficulty in obtaining lead plaster from sesame oil. It would indeed be very remarkable, and from a chemical point of view exceedingly interesting, if sesame and olive oils gave quite different reactions under the conditions in which the plaster is prepared. As a matter of fact, saponification of either oil is perfectly possible, and to show that this is so I have prepared a number of specimens, some of which are now on the table.

The oil made use of was, I have every reason to believe, perfectly pure. It was got for the purpose from Messrs. Evans & Co., Liverpool, and Mr. Conroy having kindly examined it previous to its being sent off, certified to its genuineness so far as he could judge.

The specimens were prepared as follow :—

No 1 Sesame oil plaster ; the lead oxide in B.P. proportion.					
" 3	"	"	lead oxide increased	10	per cent.
" 5	"	"	"	"	20 "
" 6	"	"	"	"	25 "
" 7	"	"	"	"	30 "
" 8	"	"	"	"	40 "
" 9	"	"	"	"	50 "
" 10	"	"	prepared in May, 1883.		
" 11	Olive oil plaster, prepared in June, 1884, B.P.				
" 12	"	"	commercial specimen, B.P.		

With the exception of Nos. 10 and 12, all the specimens were prepared in June of this year.

It is evident that Nos. 1, 3, 5 and 6 are much too soft, and the same may be said of Nos. 7 and 8. A year hence these latter may be in a condition to keep their shape in rolls, even in summer, but the attempt would not at present be very successful. No. 9 keeps quite well either spread or in roll, and in general appearance com-

pare very favourably with either of the B. P. plasters, Nos. 11 and 12. Nos. 9 and 11 were both prepared under identical conditions, towards the close of June, when the thermometer was registering 75° in the shade. No. 10, in which the proportion of lead oxide is increased at least 40 per cent., is more than a year old; it is a very fair specimen, and quite good enough to be used as a basis for other plasters. The softer plasters are of course quite rancid, though they are moderately white in colour.

In the hands of regular manufacturers, and with appliances for the purpose, a very good plaster might be made by using the same proportions as in No. 8, but the scale on which I prepared it is too small to admit of very definite opinions being formed regarding it.

The specimens of official plaster are not so white and friable as the plasters of commerce sometimes are. No. 11 is quite as good a plaster as No. 12, which was recently got in the regular course of business from a first-class house. Nos. 9 and 10 appear to be quite equal to these (Nos. 11 and 12) in every respect, though it would obviously be unreasonable to compare any new sesame plaster with the pure white article that we occasionally meet with, since the natural effects of age, not to speak of improved methods of preparation, will quite account for the difference both in colour and consistency.

In conclusion, I have only to add that the further experiments required for this supplementary report enable me to form a much more decided opinion in favour of sesame oil as a basis for lead plaster than I was in a position to give expression to a year ago.

The large proportion of lead oxide required may doubtless sometimes be a disadvantage; but the fact that we get a much purer oleate in sesame plaster than in that prepared from olive oil ought in certain circumstances to be in favour of the former.

The PRESIDENT, in moving a vote of thanks to Mr. Maben, said he would offer no opinion on the question himself, as he had no practical knowledge of it, but he would not propose to use sesame oil in pharmaceutical preparations unless it were recognised and specified. He thought some of the specimens were rather too high in colour to be satisfactory.

Mr. GERRARD said he had some experience both in plaster making and spreading, and he had tried numerous oils for the purpose of manufacturing a lead plaster. He was of opinion that there were several natural oils, besides olive oil, which were admirable for the

purpose, and that they need not confine themselves exclusively to olive oil. Of course it had become customary to use olive oil, and it must be continued for lead plaster whilst the present formula remained in the Pharmacopœia; but, nevertheless, pharmacists were in a position to discuss the properties of other oils, and there were others which would yield equally as good plasters as those made from olive oil. He had had no experience of sesame oil, but he had used nut oil, and prepared from it an excellent plaster which had keeping and adhesive properties. Lead plaster prepared from the British Pharmacopœia processes in the quantities there indicated was by no means a good preparation, as it did not contain sufficient oxide of lead, and the consequence was a neutral, or anything like a neutral oleate of lead was not obtained, but one which contained an excess of oleine and was prone to decomposition, readily becoming a rancid and, consequently, irritating application. Such a plaster underwent in certain circumstances, especially in summer weather, and if spread and packed up in large quantities, what was called heating. He had spread 400 or 500 yards at once, and in packing such plaster in a large drawer, the rolls lying on each other, he found when hot weather set in the plaster became very hot. This change was probably due to the fact that there was an excess of oil, and there was some oxidation going on through the formation of oxyoleates. This was hastened to some extent by the presence of water, and much lead plaster that was sold contained mechanically retained water, it being sent out in this form because it had a whitish appearance given by the emulsification of the water in it. If lead plaster were prepared from which water was eliminated, it became a dark, transparent colour, not attractive to the eye by any means, but one which would give the surgeon far greater satisfaction than a plaster which contained emulsified water. That usually sold by chemists had that nice whitish surface, and on the back a great quantity of sulphate of lime or other material used as backing, which made the plaster so exceedingly stiff that it was not well adapted for surgical operations. A surgeon would reject that kind of plaster for strapping up a limb, but if you spread a plaster of the transparent kind, from which all the water was eliminated, it lent itself most admirably to the irregularities of the limb, adhered well and retained its properties for a maximum period. The great object in a lead plaster was to obtain one which should be permanent and adhere for a considerable time.

Mr. NAYLOR said he could endorse a good deal of what Mr. Gerrard had said, but he was surprised at the reflection which was

thrown on some plaster manufacturers. He had never found any difficulty in preparing a plaster which was white, such as Mr. Gerrard indicated, but had never known the use of sulphate of lime. There was very little difficulty in obtaining the whitish appearance on a manufacturing scale; it was merely a matter of manipulation. He found in using oxide of lead a little more water was sometimes required to effect complete saponification with some litharge than with others, and in such circumstances one was warranted in using that extra water, but it had no business to be left in the finished plaster. If it were, he should put it down to defective manipulation.

Mr. BENDER said he was under the impression that the whitish appearance was produced by pulling the plaster in the same way as sugar was pulled.

Mr. HASSELBY said some time ago he set about making a little *emplastrum plumbi* according to the Pharmacopœia; he took the olive oil out of the oil cistern, and the litharge out of the usual litharge jar, so the conditions were those of an ordinary commercial character. It was well boiled, but he was not satisfied with its hardness, and boiled it again and again. At last he took it out, and he and his apprentice had one or two hours' good pulling at it, and they did their best to make as good a sample as they bought from the wholesale houses, but failed to do so. It struck him that his olive oil must have some sesame in it, though possibly it might be something else. He understood that if there were any carbonate with the litharge,—which should be pure oxide,—complete combination was not effected, and he intended reboiling it with fresh oxide and endeavouring to make it over again. The experiment of Mr. Maben showed very clearly that there might be something in the oil cistern as well as in the oxide of lead. After all, he thought the wholesale houses sent out lead plasters slightly too hard, and that if they were produced a little softer it would be better for the customers who used them, and it would certainly be better for the young man who had to weigh them up.

Mr. WRENN said he could quite confirm what had been said by Mr. Naylor, who he knew was accustomed to see large quantities of this plaster made. He never thought of emulsification of water; it was simply the process of manipulation by which the whiteness was obtained, and the formula of the British Pharmacopœia was followed as completely as possible.

The PRESIDENT said it was well understood that the so-called bleached shellac was produced by the introduction of water into it,

and probably from that the idea arose that in the lead plasters a little water might also produce a whitish appearance. He was not at all clear what the molecular condition might be which gave this whiteness, but it was evident some makers made much whiter lead plasters than others, though it did not at all follow that the whiter was the better plaster for surgical use; he should rather fancy a darker and softer plaster himself.

Mr. CLARK said there was no difficulty in making a very handsome white plaster precisely according to the Pharmacoposia, if good oil and good litharge were used, but some little labour was required.

The following paper was then read by Mr. Plowman—

REPORT ON THE STRENGTH AND CONDITION OF
COMMERCIAL SPECIMENS OF *HYDRARGYRUM*
CUM CRETA, *PILULA HYDRARGYRI*, AND
UNGUENTUM HYDRARGYRI.

By M. DECHAN,
Analytical Chemist.

AND

T. MABEN,
Pharmaceutical Chemist.

Acting on the suggestion of the Blue List, we have lately been devoting what time we could spare to the examination of commercial specimens of *Hydrargyrum cum cretâ*, *Pilula hydrargyri*, and *Unguentum hydrargyri*. We had hoped to be able to include *Pil. hydrarg. subchlor. co.* in this report, but the time at our disposal has been too limited to allow of this being done. We purpose confining ourselves strictly to the consideration of the "strength and condition" of the various specimens; the different methods for preparing them lie somewhat outside our present scope, and shall only be incidentally, if at all, referred to.

Hydrargyrum cum Cretâ.

The question as to the composition of this preparation has often been discussed, so often indeed that but for the sanction of the Blue List we should have hesitated to take it up. The invariable conclusion arrived at from the analysis of specimens has been that greater or less proportions of mercurous or mercuric oxides, or of both, are found to be present. Some of the older authorities were inclined to believe that the mercury existed in a state of mechanical division only, but few would now be found to maintain that opinion.

Pharmacists are all aware that the mercury is certain to become more or less oxidized in the course of time, though it is hardly possible for us to say, without actual analysis, how far oxidation has gone, or what oxides are found at any stage of the history of the preparation. The conditions under which *hyd. c. cret.* is usually prepared render it all but impossible to avoid the presence of oxide. By employing an atmosphere of carbonic dioxide, we might be certain of having only metallic mercury, and by carefully preserving the stock be able to reduce the oxides to a minimum : but the few retail pharmacists who make this preparation are doubtless of opinion that quite enough trouble is involved already, without adding more ; and those who purchase the drug must be content to take what the wholesale houses choose to give them.* Mercuric oxide being, to say the least, very much more active than the metal, pharmacists ought to be exceedingly careful that their stock of *hyd. c. cret.* should be such that no danger would attend its use. That this care is by no means so common as could be wished has been repeatedly proved, and it will, therefore, not be surprising if the result of our investigation is to add another link to the already long chain of evidence.

The method adopted by us in estimating the metallic mercury and the oxides is as follows :—

A weighed quantity is treated with excess of acetic acid, and when the carbonate is decomposed, the mixture is brought to the boiling point and then set aside to cool. The supernatant liquid is decanted, the residue being repeatedly washed with distilled water to ensure the separation of acetates. The solution contains the mercurous and mercuric oxides as their respective acetates, and to separate these it is first treated with hydrochloric acid ; this precipitates mercurous chloride, which is removed by filtration, dried at 100° C., and weighed. Sulphuretted hydrogen is then passed through the filtrate, which contains mercuric chloride in solution, and the precipitated sulphide separated, dried, and weighed. From the chloride and sulphate thus obtained are calculated the mercurous and mercuric oxides respectively. The residue after treatment with acetic acid consists of unoxidized mercury and any insoluble matter that may have been present. The mercury is dissolved out by means of warm dilute nitric acid, the insoluble residue being separated by filtration, dried, and weighed. The filtrate, after being

* The length of time required to make grey powder must always be a difficulty in the way of its preparation by retailers. We do know one pharmacist, however, who avers that he can make it in a quarter of an hour !

tested with ammoniac hydrate to make certain of the absence of mercurous nitrate, is treated with sulphuretted hydrogen, and the dried and weighed sulphate thus formed gives on calculation the percentage of metallic mercury. The moisture is best taken by drying *in vacuo*; any other method we found was unreliable. The carbonate may be estimated by loss of carbonic dioxide in the usual way. We determined the proportion of chalk in a number of the specimens by means of Rohrbach's apparatus; but as the series is not complete in this respect, we simply give the relative percentages of unoxidized mercury, mercurous oxide and mercuric oxide, the following being the detailed results of the analysis of twelve specimens :—

Hg per cent.											
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
22.05	30.6	32.75	30.6	34.05	34.4	32.62	30.3	49.6	31.17	21.2	35.8
Hg ₂ O per cent.											
2.2	Tr.	Tr.	0.22	0.26	0.1	1.95	0.17	Tr.	0.52	6.15	Tr.
Hg O per cent.											
4.67	1.4	2.79	1.4	1.86	1.15	2.32	0.65	0.88	0.92	2.8	1.0

It will be observed that in some cases the total quantity of mercury is very much more, while in others it is considerably less than the normal (83½ per cent.). This may be accounted for by the tendency of the mercury, owing to its very high specific gravity, to fall to the bottom of the bottle. This hypothesis is strikingly supported by specimen No. 9, which gives over 50 per cent. of mercury, this particular sample having been the whole that was left in the bottom of the retailer's shop bottle. The obvious remedy for this would lie in the simple expedient of shaking the shop bottle, which ought, in our opinion, frequently to be done.

The comparative absence of oxide in some of the specimens and the large proportion in others are sufficiently interesting to deserve a passing notice. The manner in which the drug is prepared and stored will doubtless have a great effect on the oxidation, and may explain why samples differ so much. We have a few notes on the relative effects on oxidation of the dry and moist methods of preparation, of exposure to air and exposure to light; but as it would drag out this paper to a greater length than is desirable, were we to take up these, we cannot enter on them at present. We may remark that we have prepared *hyd. c. cret.* by the process given in the new U.S. Pharmacopœia. When finished it had not a trace of oxide, which is more than can be said of that prepared by the

British Pharmacopoeia process; but it is not found that the U.S. preparation is any more able than our own to resist the influences of air and light.

Pilula Hydrargyri.

We are not aware that this preparation has ever been systematically examined with a view to the elucidation of the question as to whether oxides are or are not formed in it. Authorities generally are quite prepared to go the length of saying that the pill "contains finely divided and probably partially oxidized mercury," as Scoresby-Jackson cautiously puts it. Christison goes a little further, though he does not feel quite sure of his ground. "Inquiries tend to show," he says, "that the pills do not contain any oxide, but the reverse may be presumed, both from the mode of preparing them and their activity." Proctor, much more positive, very definitely states that "a small portion of the mercury is always oxidized," and again, "the proportion of oxide in blue pill, even when kept long, is very small." We have not been able to find any authority who holds that mercurial pill contains no oxide; yet our examination of commercial specimens tends to show that this is the more correct view, provided, of course, due care has been taken in the preservation of the pill-mass.

In speaking of grey powder, Proctor says it has been suggested to use sugar in the place of chalk, "but it is not found that sugar in the dry state has any protecting power over the mercury," thereby implying that sugar in the wet state may have such a power. It is somewhat surprising that the "protecting power" of sugar has not long ere this been recognised in the case of blue pill. It is well known that sugar assists certain metals to resist oxidation, and also that its natural tendency is to reduce mercurial salts. This being so, it is singular that the presence of oxide in blue pill should have been so readily assumed in the absence of direct proof, and even, as in Christison's case, in spite of proof to the contrary.

We have examined eight commercial specimens of blue pill-mass, and six of these contained absolutely no trace of either of the oxides. One contained a small proportion of mercurous oxide, but it is noteworthy that this specimen was so dry when it reached us as almost to be in a state of powder, and the percentage of mercury further indicates that it was dry when originally prepared. The other specimen contained traces of both oxides, but it also had been so dry that, before selling it, the pharmacist from whom it was procured had to work it up with a little water.

The following method was adopted for the estimation of the mercury:—

A weighed quantity of the pill is digested in warm strong acetic acid, for the purpose of dissolving out any oxides that may be present. The solution is separated by decantation, and, with the washings of the residue, examined for mercurous and mercuric acetates in the same manner as just described for grey powder. The residue is then digested in dilute nitric acid and filtered, and through the filtrate, which has a yellowish colour owing to the action of the acid on the organic matter, sulphuretted hydrogen is passed to saturation. Excess of nitric acid having been added, the sulphide is separated by filtration, dried, and weighed as before.

The colour of the acetic acid solution at once determines whether the pill has been prepared according to the official formula, i.e., with confection of roses, or whether confection of hips has been employed; the solution being of a bright pink or of a dirty grey to brown, according as the former or the latter has been used. It is exceedingly instructive to note that five out of the eight specimens were prepared with confection of hips. If this represents the ratio of adulteration of *pil. hydrargyri* throughout the country, it betrays a condition of pharmaceutical morality for which we were not prepared.*

The percentage of mercury found in each of the eight specimens was as follows:—

	1.	2.	3.	4.	5.	6.	7.	8.
Hg per cent.	37.1	33.6	31.46	41.33	33.62	28.45	35.0	31.5

No. 3 contained 1.32 per cent. of Hg_2O , and No. 4 had traces of both oxides; all the others were quite free from oxide. Nos. 6, 7, and 8 were prepared with confection of roses; the others with confection of hips. As showing that the age of the specimen has nothing to do with oxidation, we may mention that No. 1 was more than four years old. The proportion of mercury varies considerably, but in most of the cases this is accounted for by the dryness or moisture of the specimen. Nos. 1 and 7 were moderately dry, and Nos. 6 and 8 were very moist. No. 4 seems to be quite an abnormal

* Out of mere curiosity we turned up the price lists of several of the wholesale houses from which we knew some of the specimens had been obtained, and we found that without exception the quotations for the sophisticated article were from 3*d.* to 5*d.* per pound under the prices charged for the genuine; but as the cost of confection of roses is nearly double that of confection of hips, it is clear that the careless, if not unscrupulous vendors, are able to undersell their more honourable rivals, and at the same time pocket a larger profit!

specimen, as it was moist rather than dry, though the amount of mercury would indicate a very dry pill mass indeed.

Unguentum Hydrargyri.

Considerable differences of opinion exist regarding the oxidation of the mercury in blue ointment: some authorities believing that oxide is always present, either as such or combined with a fatty acid, others that the mercury is in a finely divided condition only. Of the latter we may cite Pereira, and the author of the article on "Mercurial Ointment" in Cooley's "Cyclopædia," who states that "the mercury exists entirely, or nearly so, in the metallic state, and not in the form of oxide as was generally assumed. The oxide present at any time in the ointment is variable and accidental." Christison, on the other hand, thought that "mercury must be present in the form of oxide combined with a fatty acid," but his opinion was founded on the results of an experiment which was not conclusive. The majority of those we have been able to consult agree in the main with Christison, though it is also admitted that "the mercury is only oxidised to a very small extent" (Proctor).

Our investigations tend to show that, as a rule, the mercury in blue ointment exists in the metallic condition, although oxide is occasionally present, either as such or combined with one of the fatty acids. Of twelve specimens examined, seven were quite free from oxide or oleate, two had traces of oxide, and four contained small proportions of oleate.

The following method was employed in the separation :—

A weighed quantity of the ointment is repeatedly treated with ether in order to remove the fat. The residue is digested with strong boiling acetic acid, which is decanted on cooling. The boiling causes the mercury to run together, and should any moisture adhere to the globule it is readily removed by means of blotting paper. The whole operation being performed in a tared vessel, the percentage of unoxidized mercury is at once ascertained. Any oxides that may be present in the acetic acid solution are estimated in the manner already described, and oleates are detected by passing sulphuretted hydrogen through the ethereal solution, oleate of mercury being slightly soluble in ether.

It is necessary to guard against being misled in the latter stages of the process by the presence of iron in the ointment. We have found distinct traces of that metal in several of the specimens, and this is why we cannot take as thoroughly conclusive Christison's experiment of passing sulphuretted hydrogen through an ethereal

solution. It is quite possible that iron may be introduced accidentally during the preparation of the ointment, and care must therefore be taken that its sulphide be not mistaken for the corresponding compound of mercury. This is readily accomplished by ascertaining whether the black precipitate is or is not soluble in nitric acid. The following are the detailed results:—

Unguentum Hydrargyri Fort.								Ungt. Hyd. Mit.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Hg per cent.											
38.0	39.0	40.81	40.14	44.0	44.5	46.1	46.5	13.5	16.43	10.0	10.5

Nos. 5 and 6 each contained a trace of oxide, and Nos. 7, 11 and 12, traces of oleate. No. 6 contained 0.6 per cent. of oxide combined with a fatty acid. Some of the specimens were quite rancid, but most of them were tolerably good in this respect.

Our conclusion regarding the condition of mercurial ointment is that, as a rule, the mercury exists in the metallic state, though oxide, either as such or combined with a fatty acid, may be present. The method of preparation, rather than atmospheric influences, would seem to play the principal part in any change undergone by the mercury.

The strength of the specimens varies very considerably. This might be accounted for by the mercury settling to the bottom of the pot, assuming that the whole had been melted; but in that case we would have naturally expected some of the specimens to give much higher results. If prepared according to the British Pharmacopœia, the ointment ought to contain 49.5 per cent. of mercury, but it does not appear that *ungt. hyd. fort.* is at all synonymous, in the opinion of many wholesale dealers, with *ungt. hyd. B.P.* Cooley states that "the *ungt. hyd. fort.* of the wholesale houses is generally made of mercury, 12 lbs., suet, 1½ lbs., and lard, 16½ lbs."; consequently the ointment contains only 40 per cent. of mercury. If this statement is correct, the low percentage in some of these specimens is readily explained.

Unguentum Hydrargyri Mitius seems to be prepared according to various formulæ. The usual strength is one of strong ointment to two of lard, and such seems to have been the way in which Nos. 9 and 10 had been prepared. The other two, however, must have been one to three, a strength which, to say the least, is somewhat weak, more especially when the *ung. hyd. fort.* is rather weak to begin with. Some time ago a case was before the courts under the

Adulteration Act, where a chemist was charged with selling mercurial ointment containing 16 per cent. of mercury. The case was dismissed, and very properly so; but we question if the same result would have been attained had any of the four samples given above been under discussion.

Without expressing any decided opinion on the results of our investigation, as tabulated in this report, we may be allowed to remark that the care and accuracy which ought to be characteristic of the profession of pharmacy seem, in some cases, to be conspicuous by their absence. It is quite true that preparations in which metallic mercury occurs are more apt to vary than most others in the Pharmacopœia; but this cannot be an excuse for an evidently systematic arrangement whereby a weaker article, as in the case of *ungt. hyd. fort.*, is frequently supplied. Unfortunately, retail pharmacists are not generally in the habit of making their mercurial galenicals, the more common practice being to order these along with the drugs. The majority of pharmacists thus deliver themselves, so to speak, into the hands of the manufacturers; and where there is little opportunity, and probably less disposition, to be critical, there is no wonder that things are not always kept up to the correct standard.

The PRESIDENT proposed a vote of thanks to the authors. He said he had heard the paper with a certain amount of dissatisfaction; for, supposing the results were correct, the state of things represented was anything but creditable to pharmacy, and he hoped some explanation would be given upon certain points. It proved the necessity that such bodies as the Conference and the Pharmaceutical Society should be unceasing in their efforts to promote a high standard in pharmacy.

Mr. SCHACHT said there was a good deal in the paper which deserved attention. Pharmacists ought to be able to receive any amount of criticism on the way they conducted their business; at the same time, although the Honorary Secretary had not read the whole of the paper quite literally, some of the strictures might not be altogether deserved. It appeared to him that grey powder was one of those preparations which it would be highly desirable that chemists should, as far as possible, make themselves, and not leave to the wholesale gentlemen to prepare for them; for this reason. It had been declared publicly by preparers of grey powder in large quantities, that it was done by a mechanical process, which their

large establishments enable them to accomplish with economy of labour. A large quantity of material was put into a tub, into which was introduced a boulder, and the whole was fixed on to a piece of machinery and made to revolve for an indefinite length of time. Now it stood to reason that an element like mercury, which had an affinity for oxygen, was there placed under favourable circumstances for effecting combination, and although the product at the end of the process might be a wonderfully finely divided metal, a fineness of division which he believed the authorities did not declare to be necessary, there was great risk of getting some portion of the finely divided mercury converted into oxide. This was an article he was a little particular about, and he recommended dispensing pharmacists to prepare it themselves. It only required a small amount of labour to make a moderate quantity, and if their experience were like his, namely, that the use of mercurials amongst medical men was rather less than it used to be, a moderate quantity would last a long time. Notwithstanding that this principle had been long adopted in his own establishment, he had to confess that a short time since he had examined his own stock and found it to contain distinct traces of oxide. It had been of course immediately thrown in the dusthole, and a fresh quantity made. It was quite possible a similar mischance might occur to others who were innocent of any intention of having anything but the most perfect article in their possession. Although they were open to criticism, critics should be extremely careful, and when the authors gave as the result of an investigation the exact quantity of mercury traceable in mercurial ointment, it was rather unfortunate they should have omitted altogether that which he was bound to admit might occur, a possible combination of a part of the mercury with the fatty acids. They stated what was found in the shape of mercury proper and oxide of mercury, but appeared to have overlooked that mercury in combination with fatty acid might be perfectly soluble in ether. He separated the fat, and he separated the ether, but he might have carried away a lot of mercury in combination with the fat. Some years ago, whilst experimenting with nitrate of mercury ointment, he found a large proportion of mercury there had passed into combination with the fat, and that the compound was soluble in ether. Therefore Mr. Maben had scarcely done justice to pharmacists in the determination of the amount of error which existed in the ointment. With regard to blue pill, he had not attacked that subject lately, but he strongly recommended dispensers to make their own grey powder.

Mr. PLOWMAN said he had only read an abstract of the paper; but he had stated that the authors recognised the fact that oleate of mercury was soluble in ether. With regard to the *pilula hydrargyri*, it was a subject he had not practically investigated himself, but he remembered being present at an evening meeting of the Pharmaceutical Society when Mr. Harold Senier read a paper on the composition of *pilula hydrargyri*, in which the author stated he found very distinct quantities of the oxides of mercury, and his experiments clearly pointed to the fact that the amount notably increased with age. He believed that in one freshly prepared specimen Mr. Senier found no oxide, but in one a little older he found it, and it increased as time progressed. In the discussion which then ensued, Professor Redwood rather took an opposite view, and thought with Mr. Schacht that the making of these preparations by machinery had a considerable influence on the proportion of oxide, especially in *hyd. cum cretâ*, and that if the pharmacist made it himself the proportion of oxide would not be great. Mr. Bottle some years ago advised the pharmacist to make *hyd. cum cretâ* himself, by putting the ingredients in a bottle and shaking them, and stated that in this way the mercury might be "killed" in a very short time.

Mr. TYLER said this subject of the mechanical compounds of mercury had great interest for him. He was inclined to agree with the general conclusions of Mr. Schacht and Mr. Plowman; but he also thought the manufacturers and wholesale houses had been rather strongly dealt with. As one of that unfortunate class, he felt himself somewhat courageous in defending them; but he had had opportunities extending over twenty-five years in the manufacture of these things, especially the former and the latter, and had made it his business as a chemist to examine the conditions under which they were produced, and make careful analyses of the results of the conditions immediately after the operation had been ended, and at various stages. He might parenthetically observe with regard to some of the papers read, that much of the work done at meetings of this kind reminded him that the element of time was one which no manufacturer should omit to take account of. With regard to the oxidation of grey powder, he knew no difference between the result of working in the old-fashioned method on a large scale with a large mortar and pestle, and working on what might be called the economic manufacturing scale. With reference to *hyd. cum cretâ*, immediately after the preparation on what may be called a large scale by the old method, and still larger scale by

the new method, there would be found no difference; but in a month a difference would be perceptible, and in three months still more, and so on until a point was reached when the oxidation ended, though what that point was he was not prepared to say at the moment. He had examined a specimen twenty years old, to see what the amount of oxidation would be under those conditions, and other specimens down to some made within the last week. There were two modes of preserving specimens. When he was a student at the old College of Chemistry, he remembered Dr. Hofmann used to say, "See how much you can vary the conditions," and that remark in his case did not fall on barren soil; he thought there was a great deal in it. He had observed the difference in samples of *hyd. cum cretâ* which were practically hermetically sealed, and those which were exposed to light and air, and he found the difference with the very same sample was as great as it was possible to conceive. Therefore, he suggested that in putting up *hyd. cum cretâ* in paper the process of oxidation might be facilitated. One suggestion occurred to him, therefore, that in making *hyd. cum cretâ* it should be put up in the smallest size bottles, but manufacturers were obliged to do as they were told, or lose their business. Still there was no reason, if grey powder deteriorated unless it were put up in the smallest quantities consistent in something like practicability, why that method should not be adopted, but of course the trouble must be paid for. If Mr. Schacht's advice were followed, it would be a serious matter, and it was well deserving attention from an economical as well as pharmaceutical point of view. But he rose to say for his firm and other manufacturers, that they would be exceedingly weak if they did not attempt at once to try and secure to themselves the *prestige* they had been working hard for—in fact, to secure their business, and put it out of the range of possibility of gentlemen of ability in conducting such researches to pass such strictures at all. The question of the fatty compound oleates was one which deserved even fuller notice than it had at the hands of the authors in their account of the ointments. With regard to the discussion that morning on lard, he thought Mr. Naylor's point on rancidity was more important than it seemed to be regarded. If lard were rancid it would be acid as a rule, and one got a condition in making up ointments never contemplated by the physician. With regard to what might be called the mechanical methods of producing these things, he was old-fashioned enough to believe there was nothing like working with a diligent strong arm; but patience, care, and the exclusion of

human infirmity were involved, and these were never all obtained. Some people said that in modern days the British workman was more careless than ever he was; but at any rate one way of avoiding in the highest degree the probability of human error was to have the best mechanical appliances, and it would be a poor thing in these days if one could not have mechanical appliances which would produce any required result. With regard to the quantities of mercury found, he was simply astounded, and the differences involved could not be accounted for by oxidation or rancidity, and must be due to an evasion of the provisions laid down for the preparation of those articles. If a man asked for a preparation, he should have it. As a manufacturer, he felt the honour and respectability of deserving and well-intentioned manufacturers were discounted by the acts of persons who perhaps did not carry their honour at the right place. A mixture of say, "brickdust," with preparations was not allowable by law, and should most distinctly never be sent out. It was said if there was no demand there would be no suppliers. Of course if no one asked for these things there would be nobody to supply them; but if manufacturers said one and all, "No, we will not supply sophisticated goods," that would be the proper course of action. This was suggested to his mind by the weaker ointments. He had not read Cooley for some time, but he was reminded that in old days in ninety-nine cases out of a hundred when *ung. hyd.* was asked for it meant *ung. hyd. fort.* As to what should be understood as being intended by the weaker ointment, as there was no recognised form, it was probably an open question; but certainly if a compromise were made, 16 per cent., which is practically in round numbers one-sixth, was low enough for any weak ointment. He had not had the same experience with regard to the *pil. hyd.* The authors of these papers, in analysing all these compounds of mercury, had used methods accurate and reliable, and which could be practised behind the counter of any pharmacy, and he did hope that in any future Pharmacopœia the tests would be such as might be applied by men of reasonable ability and practical capacity and experience. Pharmacists would be glad of this very simple method of distinguishing between *pil. hydrarg.* made with the "hips" and those made with confection of roses.

The PRESIDENT said they were all much indebted to the authors of this paper, dealing with a subject of primary importance. They all knew what a serious matter the presence of the hydrargio per-compound was, and Mr. Schacht had pointed out that if ole-

ates were formed, they would only be formed with per-salts, and not proto-salts, and that it would be really making a per-salt more effective for mischief than it would be by itself. Altogether he must, as President, express a very strong feeling of astonishment that it should be possible for such papers to be written, and he should like to have some explanation as to the conditions and circumstances under which these samples had been obtained.

The following paper was then read by Mr. Bengier—

ON IODINE IN COD-LIVER OIL AND OTHER MARINE PRODUCTS.

By EDWARD C. C. STANFORD, F.C.S.

In a paper on this subject read before the Pharmaceutical Conference at Southport, last year, I found the proportion of iodine in cod-liver oil to be much less than the results published by other observers.

Taking the average of six samples from different sources, I found them to vary from '000138 per cent. to '000343 per cent., the average being '000322 per cent. The amount contained in the fresh liver was more than twice as much, '000817 per cent. Since then I have had the opportunity of examining two genuine samples of which I know the origin, with the liver from which these have been extracted; one was sent me by Mr. Gale, of Messrs. J. Bell & Co., and the other was made by myself. I obtained 14 ounces of oil and a little water from $2\frac{1}{2}$ lbs. of liver. All were examined for iodine, with the following results:—

	Per cent.
Cod-liver Oil, Gale, filtered . . .	'000040
" " " unfiltered . . .	'000052
" " " marc . . .	'000200
" " Stanford . . .	'000077
" " " marc . . .	'000765
" " " water . . .	'000680

I think therefore, from the analyses of these oils of known origin, we are justified in the conclusion that iodine has little to do with the therapeutic value of the oil.

Oysters.—It is commonly supposed that these delicious esculents are rich in iodine. The Anglo-Portuguese variety has been specially reported on. These oysters are obtained from about thirty

miles of coast extending from Lisbon to Cacillias Point, and are nursed and fattened in England.

Dr. Champoullion, of Paris, published a report on these oysters in 1876, from which the following is an extract:—

“Oysters fattened on the English coast and submitted to the same analytical processes are found to be far less rich in iodine and bromine than those of Portugal. These latter, owing to their special constituents, represent a valuable dietary article of a nature to prevent scrofula, ganglionic gathering, rachitis, and perhaps also phthisis, among classes condemned to physiological misery by the very conditions of their existence. The Portuguese oyster deserves therefore to engage the attention of medical men.”

He found that 1 kilo. gave 760 grams of water and .039 gram of iodine, and .062 gram of bromine; or iodine .0039 per cent., and bromine .0062 per cent. My attention was called to this report at Southport, and I took some trouble to secure a supply of genuine Anglo-Portuguese oysters. The amount of iodine found was .00004 per cent., or 4 parts in ten millions. Whatever, therefore, may be the value of oysters in the maladies alluded to above, we may be permitted to doubt if any of these advantages are due to the iodine contained therein.

Sponge.—*Spongia usta*, or burnt sponge, was long used as a medicine, and formerly official in the Dublin Pharmacopœia. According to Pereira, it was employed “as a resolvent in bronchocele and scrophulous enlargement of the lymphatic glands. Its efficacy is referable to the presence of iodine and bromine.” The tests employed show that the iodine was the element required in it.

Herberger found in it, iodide of potassium, 1.16 per cent. = iodine, 0.887 per cent.; bromide of potassium, 0.702 per cent. = bromine, 0.48 per cent., and traces of copper.

Preuss found, iodide of potassium, 2.14 per cent. = iodine, 1.636 per cent., and bromide of sodium, 0.76 per cent. = bromine, 0.59 per cent.

Posselt found 3.59 per cent. of ash.

Croockewit found 3.7 per cent. of ash and 1.09 per cent. of iodine, also 0.50 per cent. of sulphur and 1.90 per cent. of phosphorus.

I am indebted to Mr. D. Frazer, of Glasgow, for a supply of fine sponges, and I append the results of analyses of these:—

	Fine Turkish.	Honeycomb.
Water	19.40	19.40
Organic matter.	69.89	50.24
Ash soluble in water . . .	2.21 } Ash,	3.70 } Ash,
Ash insoluble in water. . .	9.00 } 11.21.	26.66 } 30.26
	100.00	100.00
Iodine	200 = 4.48 lbs. to ton.	2054 = 1.2096 lbs. to ton.
Iodine on sol. salts . . .	9.060	1.460
Per ton of salts	202.7 lbs.	32.7 lbs.
On the total ash	0.1779 per cent.	1.7841 per cent.
Per ton of ash	4 lbs.	39.96 lbs.

The salts contained only a trace of potash, as free alkali, chloride of sodium and sulphate of lime. Turkey sponge is therefore very rich in iodine, but its value per pound is unfortunately about twelve times that of iodine. The insoluble ash is principally sand. I hope to give some further details of this ash later on. The sponge was carbonized and the salts extracted from the charcoal. I have shown in a former paper, that the iodine is rapidly volatilized when an organic compound containing it is burnt to complete ash, especially in the presence of silica. I will only add that it will afford me much pleasure to examine any home-grown sponges or other marine products that may assist our knowledge of the distribution of iodine, if any of our members who reside near the sea will favour me with samples of not less than 5000 grs.

Mr. Plowman read the next paper, which was entitled—

PROXIMATE ANALYSIS OF THE RHIZOME OF *ALPINA OFFICINARUM* (HANCE).

By J. C. THRESH, D.Sc., F.C.S.

Until very recently all that was known of this drug was that its odour was due to a volatile oil, and that it contained a crystalline body, which had been discovered and imperfectly examined by Brande (*Archiv Pharm.* [2], 19, 52). In 1881 Jahns published in the *Berichte* the results of his examination of Brande's "Kämpferid." He found that, together with this body, galangal rhizome contained two other closely allied bodies, which he named "galangin" and "alpinin" respectively. My object in studying the

chemistry of the drug was to isolate the pungent principle; but as at the same time it seemed advisable to ascertain the nature of its other proximate constituents, a number of experiments were made with that object, and the results are now recorded.

Ash.—1.198 gram left a grey-brown ash weighing .0461; or 3.85 per cent. Like the ash of most other members of the order *Zingiberaceæ*, it was rich in manganese.

Moisture and Volatile Oil.—Dried at 110°, 1.985 grain lost .287, and 1.837 lost .262; or 14.5 and 14.3 per cent. respectively.

Petroleum Ether Extract.—The petroleum ether residue corresponded to 2.7 per cent., of which .6 per cent. was volatile. After removal of this volatile portion the residue no longer dissolved completely in petroleum ether. The insoluble portion was soft and resinous, soluble in warm S.V.R., in acetic acid, ether, chloroform, and solution of potash. Only slightly soluble in ammonia, carbon disulphide, and benzol. The alcoholic solution was neutral, darkened by Fe_2Cl_6 , and precipitated copiously by $\text{Ba}_2\text{H O}$. Lead acetate gave a granular yellow precipitate soluble in boiling alcohol. The weight of this insoluble portion = .375 per cent. of the rhizome.

A portion of the petroleum ether extractive was insoluble in rectified spirit. It also was a soft brown resinous matter, soluble in petroleum ether, benzol, and carbon disulphide, but not in aqueous or alcoholic solution of potash. Quantity, .154 per cent.

The remainder of the petroleum ether extractive consisted of a mixture of fat and active principle. By dissolving in petroleum ether and shaking with 50 per cent. alcohol, the active principle is taken up by the spirit. The ether when evaporated leaves a residue of pale brown soft transparent fat, insoluble in acetic acid, and only slightly soluble in warm S.V.R. After saponification the fatty acid dissolved in spirit, and was precipitated by zinc, barium lead, and copper salts, but not by magnesium salts. The alcoholic solution of the fat did not reduce ammoniacal silver nitrate. The fat itself has an exceedingly disagreeable and persistent taste.

The Active Principle Galangol.—Upon evaporation of the alcohol solution a semi-fluid pale yellow residue remained. It was very pungent, easily soluble, even in dilute alcohol and in solutions of fixed alkalies. It did not dissolve in ammonia, and its alcoholic solution was not precipitated by lead acetate and ammonia. By boiling the alcoholic solution with a little silver nitrate and ammonia, the tube becomes coated with a metallic mirror, but the reduction is not so readily effected as with the active principle of ginger or grains of paradise. Further information with regard

to this body will be found in my paper on the "Pungent Principles of Plants."

Exhaustion with Ether.—The galangol which had been exhausted with petroleum ether was next treated with dry ether. Upon evaporation of the ethereal solution a brown-black pulverulent residue was obtained, corresponding in weight to 2.25 per cent. of the original drug. Of this .1 per cent. was matter which had previously escaped the action of petroleum ether.

This residue is of an exceedingly complex nature. It contains—

(a) Kämpferid, galangin, alpinin, and probably other bodies, soluble in dilute solution of sodium carbonate and in alcohol, and precipitated from the latter solution by lead acetate. On decomposing the lead precipitate, etc., these substances are easily obtained, in form of minute sulphur-yellow coloured crystals.

(b) Other crystalline bodies, closely resembling the above, but not precipitated by lead acetate.

(c) A small quantity of a black, resinous matter, insoluble in sodium carbonate solution.

Alcoholic Extractive.—This contained a tannin (giving a green colour with ferric salts), glucose, phlobaphane, and other substances not recognised.

Aqueous Extractive.—After exhaustion with alcohol, the powder yielded to water a slightly acid, red-brown infusion, containing glucose, oxalic acid, mucilage, colouring matter, etc. The infusion is rich in oxalates.

After extraction with water, the residue was treated successively with .2 per cent. soda solution, 1 per cent. hydrochloric acid, and finally in the residue the starch was estimated. The alkaline solution evidently decomposes some constituent of the plant, for it yields a deep red solution, which is not precipitated by addition of either acetic acid or alcohol. Sulphuric acid, however, throws down an abundant precipitate of red-brown flocculent matter, leaving the supernatant solution nearly colourless. The precipitate was collected, dissolved in a little dilute ammonia, and reprecipitated by hydrochloric acid. It dissolves in solutions of the alkaline hydrates and carbonates, and is precipitated from these solutions by mineral acids, but not by acetic acid. It dissolves in alcohol, and this solution, when diluted with water, does not become turbid, but precipitates with barium, calcium, silver, and lead salts. It only slightly reduces Fehling's solution, even after prolonged ebullition with dilute acids. The yield of this "galangal red" corresponded to 2.8 per cent. of the rhizome.

The albumenoids were determined from the amount of ammonia yielded on combustion of the powdered rhizome with soda lime.

A tabulated result of the analyses is appended.

Volatile Oil	·6	} Sol. in P. Ether 2·88
Resin	·15	
Fat and Galangol	1·58	
Kämpferid, etc., pre- cipitated by Lead		} Sol. in Ether. 2·62
Acetate	1·44	
Crystalline matters not precipitated by Lead		
Acetate	1·18	
Tannin		·56
Phlobaphane		1·22
Glucose		·98
Oxalic Acid		·32
Mucilage, etc.		2·55
Galangal Red.		2·80
Starch		23·7
Albumenoids		2·55
Moisture		13·8
Ash		3·85
Cellulose, etc., by difference		40·72
		<hr/> 100·00

The following paper was then read by Mr. P'owman—

NOTE ON SULPHURATED LIME.

By T. S. DYMOND.

This note is the result of a few experiments made to determine which of the processes that have been suggested or employed for the production of sulphurated lime is the best.

Process I.—One hundred parts of lime in fine powder was mixed with 90 parts of precipitated sulphur, the mixture was gently packed in an earthen crucible, and the lid luted on. The crucible was now heated for one hour in a charcoal fire at a low red heat, the heat being applied to the top first and gradually continued downwards. The sulphurated lime was cooled and rubbed to a powder.

The resulting substance was brown in colour, and had a faint, peculiar odour, somewhat resembling sulphuretted hydrogen, but distinct from it. It contained about 30 per cent. of sulphide of calcium.

This was estimated in the following way: 1.25 grams of sulphate of copper is dissolved in 50 c.c. of water. To this solution, kept acid with a little hydrochloric acid, the sulphurated lime is added, and the mixture is heated nearly to boiling. When all the sulphurated lime is decomposed, a little of the filtered liquid is tested with ammonia for copper. If the liquid becomes blue, the mixture is cooled, a little more of the sulphurated lime is added, and the process repeated as before, till all the copper has been precipitated from the solution. From the amount of the sulphurated lime which has been found necessary to decompose 1.25 grams of sulphate of copper, the percentage of sulphide of calcium may be easily calculated.

Process II.—Sulphuretted hydrogen was passed through dry slaked lime for eighteen hours. The resulting substance was of a light green colour, and had an unpleasant odour similar to the odour of that prepared by Process I., but more resembling that of sulphuretted hydrogen. It contained 5.7 per cent. of calcium sulphide.

Process III.—Sulphuretted hydrogen was passed through slaked lime made into a paste with water, for eighteen hours. The colour of the resulting body was dark green, but on heating to redness changed to a light pink colour. The smell was similar to the smell of that prepared by Process I., but not so strong. On adding acid sulphurous vapours were given off, indicating the presence of a sulphite. It contained 6 per cent. of calcium sulphide.

Process IV.—Seven parts of finely powdered sulphate of calcium was thoroughly mixed with 1 part of wood charcoal, also finely powdered, and the mixture heated in an earthen crucible at a red heat till the black colour had disappeared. Allowed to cool.

The resulting sulphurated lime was of a light pink colour similar to the colour of that prepared by Process III., and had a smell like that of the variety prepared by Process I., but stronger. It contained 58 per cent. calcium sulphide.

Reviewing these four processes and their results, the second and third may be at once condemned on account of the greater difficulty of production and the small proportion of calcium sulphide in the sulphurated lime that results. Of the two other processes, No. 4 is the better, for not only do the directions with regard to exclusion of air and mode of heating render the first process more difficult to perform, but the sulphurated lime which results does not contain much more than half the calcium sulphide contained in that produced by the last process, nor is it so elegant a preparation.

That prepared by the action of charcoal on sulphate of calcium will therefore best satisfy producer, prescriber, and consumer.

Votes of thanks were passed to the authors on the motion of the President, who remarked with reference to Mr. Dymond's paper, that the important point was that he proved that sulphide of calcium made by means of sulphuretted hydrogen was not the best form for producing a medicinal preparation, and he quite agreed with that view. He had tried various methods, and, as far as his memory served him, his own conclusions very closely approximated to those of Mr. Dymond.

An abstract of the following paper was then read by Mr. Bengier—

THE ESTIMATION OF DIASTASE IN EXTRACT OF MALT.

By T. S. DYMOND.

Now that extract of malt has become such a popular remedy, it is necessary to be readily able to determine its value. This depends largely on the amount of diastase the extract contains, and hence, this is the substance to be estimated.

There are two processes which have been suggested for this determination, one by Messrs. Dunstan and Dimmock in 1879 (*Pharm. Journ.* [3], ix. 733), and the other by Mr. Carl Jungk in 1883 (*Pharm. Journ.* [3], xiv. 104). The object of this paper is to show which of these is the more reliable, and to point out a modification which may be made on the more reliable process to render it more simple and rapid.

The two processes both depend on the power which diastase exerts on starch, first rendering it soluble, and then converting it into dextrin and sugar; but while Messrs. Dunstan and Dimmock estimate the diastase by the amount of malt extract required to effect the conversion of a definite amount of starch in a definite time, Mr. Carl Jungk estimates it by the time taken by a definite amount of malt extract to effect the conversion of a definite amount of starch.

Mr. Carl Jungk's Method.

A mucilage is made of 10 grams of starch in 150 to 180 grams of boiling water. This is cooled to 100° F., and to it is added a solution of 10 grams of extract of malt in 10 c.c. of water, also

at 100° F. Keeping the mixture at that temperature, 1 drop is added every minute to successive test tubes full of water, each containing 1 drop of standard solution of iodine, till no coloration is produced in the liquid. A good extract, Mr. Carl Jungk says, should convert its own weight of starch within ten minutes at 100° F.

Four experiments were made in order to try the efficiency of this process, all with extracts of fair average diastatic strength. The following tables give the changes of colour which were observable and the time in which these changes took place :—

Experiment I.

Blue—				
Purplish blue	.	.	.	After 3 minutes.
Purple	.	.	.	" 5 "
Pinkish purple	.	.	.	" 8 "
Brownish purple.	.	.	.	" 15 "
Very light brown.	.	.	.	" 90 "
Almost colourless	.	.	.	" 120 "

Experiment II.

Blue—				
Purple	.	.	.	After 4 minutes.
Violet	.	.	.	" 6 "
Red	.	.	.	" 12 "
Pinkish yellow	.	.	.	" 18 "
Yellow	.	.	.	" 22 "

Experiment III.

Blue—				
Purple.	.	.	.	After 5 minutes.
Pink	.	.	.	" 10 "
Yellowish pink	.	.	.	" 20 "
Light brown	.	.	.	" 25 "
Yellowish brown.	.	.	.	" 40 "
Dark yellow	.	.	.	" 4 hours.

Experiment IV.

Blue—				
Purple	.	.	.	After 5 minutes.
Pinkish purple	.	.	.	" 10 "
Brownish purple.	.	.	.	" 20 "
Light brown	.	.	.	" 25 "
Yellowish brown.	.	.	.	" 3 hours.
Dark yellow	.	.	.	" 5 "

In all cases the solutions were blue after standing for twenty-four hours, and if the iodine solution was added to the flask in

which the mixtures of starch mucilage and malt extract solution were placed, a blue colour was produced at once. The conversion of the starch, therefore, was not complete, the disappearance of blue colour being probably due to the brown compound which excess of iodine produces with starch and dextrin, the blue colour asserting itself when the excess of iodine had volatilised. This test, it is clear, gives fallacious results, and cannot be employed for the estimation of the actual diastatic value of extract of malt.

Messrs. Dunstan and Dimmock's Method.

1 gram of starch is gelatinized with 100 grams of water, and the mucilage is mixed with various quantities of 10 per cent. solutions of the malt extract, and the mixture kept at a temperature of 100° F. for three hours. Iodine solution is then added to a portion of each mixture, in order to indicate to which just sufficient malt extract has been added to completely convert the starch. The amount of malt extract added to this mixture indicates its diastatic strength in terms of power of starch conversion.

Several experiments were made in order to test the efficiency of this process; they were attended with good and constant results.

The one difficulty in the process is, that in order to determine the value of an extract of unknown diastatic strength, a great number of experiments have to be made, and these take time and space, and much trouble in keeping at a temperature of exactly 100°. Dr. William Roberts (*Proc. Royal Soc.*, xxxii., 151) has suggested a modification of the above method which to some extent meets this difficulty. As the time required to effect conversion of starch into dextrine and sugar by means of malt extract is proportional to the amount of diastase that malt extract contains, he first determines the approximate strength of the extract by the time the conversion takes place, and then the absolute strength in other experiments in the way suggested by Messrs. Dunstan and Dimmock, by these means doing in two or three experiments what would otherwise require six, eight, or even twelve.

It will be found simpler to go still further, and alone to determine the time taken by a unit amount of malt extract to convert a unit amount of starch. After several experiments, the following was found to work well:—1.5 gram of malt extract is dissolved in 15 c.c. of water and mixed with a mucilage of .1 gram of starch in 100 c.c. of water. The mixture is raised to 140° F. in temperature, and tested from time to time by adding two drops of iodine solution

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to 5 c.c. of it, and comparing with 5 c.c. of a similar mixture to which no starch has been added. No difference of tint between the two solutions indicates completion of the reaction. A very good malt extract will accomplish this within half an hour, but many commercial extracts will not do so until nearly three hours. If the reaction is not complete within three hours, the extract should be condemned, as it has probably been evaporated at a temperature at which more or less of the diastase has been destroyed.

Mr. Benger then read an abstract of the following paper—

REPORT ON COMMERCIAL PERUVIAN BALSAM AND THE METHODS FOR ASCERTAINING ITS PURITY.

By PETER MACEWAN.

The primary object of this paper was to report on the purity of commercial Peruvian balsam (Blue List, subject 248), but the writer has also commented on the more important tests for the balsam, some of which seemed to require notice.

The high price which the balsam occasionally attains tempts to adulteration, and the crude method of manufacture, so graphically described by the late Daniel Hanbury, favours admixture; this is indeed so much the case that of recent years the balsam has been subjected to a process of purification at the ports of shipment (*Pharm. Journ.* [3], xiv. 861). Sophistication of the balsam has been more observed on the Continent than in this country, probably because it is less used here than there; the effect on the literature of the subject is that the bulk of it has emanated from foreign pharmacists.

Source of the Specimens Examined.—Time has limited the number of specimens examined. Altogether twelve are reported on: of these five were obtained from retail pharmacists, four from wholesale houses—all recently stocked,—and three were kindly procured for me by Mr. J. B. Stephenson, through the agency of a London firm. These specimens were obtained from consignments on board ship, and may be taken to represent the balsam as received in this country. A specimen of *Myroxylon Pareira* bark was received from Mr. E. M. Holmes. The writer here expresses his obligations to these gentlemen for their assistance.

Method of Examination pursued.

I. PRELIMINARY TESTS.—These are such tests as afford, or are understood to afford, indication of impurity.

A. Specific Gravity.—On this important point our Pharmacopoeia is silent, a silence due, probably, to uncertainty. At the time of the publication of *Pharmacographia*, edit. i., the specific gravity of commercial balsam was from 1·150 to 1·160. Since then it has decreased considerably, and in the last edition of the German Pharmacopoeia it is given as 1·137 to 1·145, and in that of the United States as 1·135 to 1·150. This decrease is understood to be due to a modification which the balsam undergoes in the process of purification already referred to. Although, therefore, the low specific gravity of recent years "is quite consistent with the purity of a given sample," it should be kept in mind that all known adulterants lower the gravity, so that a determination of this factor is of great importance. It will be observed from the appended table that specimens lower than 1·140 are the exception, and that 1·1376 was the lowest. The latter was a very fine specimen, exceptionally rich in cinnamain, and the writer concludes that the minimum of the P.G. and the maximum of the U.S.P., viz. 1·137 to 1·150 at 15·5° C., form fair and reasonable limits; a high maximum being no disadvantage, whereas a low minimum is.

B. Sulphuric Acid Test, U.S.P.—One volume of balsam is rubbed up in a mortar with two volumes of sulphuric acid. When washed with cold water it should form a brittle resinous mass when cold. If fixed oil is present the mass does not harden.

(Note.—If the mass be washed with hot and then with cold water, as recommended by O. Schlickum (*Pharm. Journ.* [8], xiii. 821), it does not harden, even though the balsam be quite pure.)

The test also detects copaiba. Ten per cent. of the adulterant causes little alteration, but 15 per cent. causes evolution of sulphurous acid and white vapour, and as the percentage increases the decomposition becomes more marked.

C. Ammonia Test, P.G. Originated by Dr. C. Grote (*Year-Book*, 1881, 219).—Five drops of balsam shaken up with 3 c.c. of solution of ammonia should give very little froth, and should not gelatinize in twenty-four hours. The test is calculated by the originator to detect 20 per cent. of common resin or colophony. For this purpose it is admirably adapted. A balsam containing 7 per cent. of common resin gave an abundant froth (twice as much as the solution), but did not gelatinize; while pure balsam and balsams containing

storax, fixed oil, and benzoin, gave froth amounting to only about one-sixth of the solution.

Using Solhickum's modification of the test, the writer failed to get any indication of storax in a balsam containing it.

D. Flückiger's Lime Test. (*Pharm. Journ.* [3], xii. 45).—"Ten drops of balsam shall furnish with 0.4 gram of slaked lime a mixture which remains soft," the mixture being at most "kneadable or somewhat friable, and readily divisible." Whereas Professor Flückiger found that balsams which were adulterated or "to which storax, benzoin (evaporated alcoholic solution), colophony and copaiba balsam were added, gave very hard, no longer kneadable, masses." As the writer's results are markedly different from those of Flückiger, he gives them here in detail :—

Pure balsams gave smeary masses which became of a pilular consistence in from six to thirty-six hours, when they became crumbly.

Adulterated balsams.—Storax, 10 per cent., gave a smeary, sticky paste, which assumed a pilular consistence in two hours, and was brittle and crumbly in six hours. Experiment repeated with addition of two drops rectified spirit gave a smeary paste which became brittle and crumbly in *twelve minutes*. *In both masses the odour of storax was well marked.*

Copaiba, 10 per cent., gave a very thin paste which dropped off the pestle, but was of a pilular consistence in five minutes, and became brittle and crumbly in an hour. *The mass possessed the distinctive odour of copaiba.*

Colophony, 7 per cent. (alcoholic), gave a mass which became brittle and crumbly in two minutes.

Benzoin, 8 per cent. (alcoholic), became of stony hardness in five minutes.

These results being somewhat unsatisfactory, Grote's modification of the test was tried. The test as given in *Pharm. Journ.* [3], xiv. 424, is the following :—

"One gram of the balsam is mixed with one or two drops of spirit, and to ten drops of the mixture 0.4 gram of slaked lime is added. If the balsam is pure the mass will not harden; should that take place the sample is adulterated, probably with storax, benzoin, colophonium, copaiba, or tolu."

In the experiments $2\frac{1}{2}$ minims of rectified spirit and $12\frac{1}{2}$ of balsam were mixed; of this mixture 10 minims were rubbed up with 6 grains of slaked lime. Of nine pure specimens so treated, seven gave a smeary paste, becoming of a pilular consistence in two minutes, crumbly in from five to twenty minutes, and stony hard in

twelve hours. Two of the specimens became crumbly in the mortar, so that when removed they had a scaly appearance. Balsams to which storax, benzoïn, copaiba, or colophony were added, gave the smeary paste which passed through the pilular and crumbly to the stony condition, as the pure balsams did; while the only one which remained permanently soft was that to which 10 per cent. of castor oil had been added.

It thus appears that the test in its original form does not give the results which it is said to afford, copaiba being the only adulterant which gives hardening at all approaching to what might be expected, and it will be gathered from the nature of the experiments that Grote's modified test is neither more nor less than a test for the alcohol added, unless we include fixed oil, which it does not profess to detect. The odours afforded by copaiba and storax indicate their presence in the mass.

Minor Tests.—The B.P. water-test is a rough method of detecting alcohol, which is more readily indicated by low specific gravity, while the benzin test of the U.S.P. readily indicates fixed oil. As benzin, U.S.P., is a petroleum spirit of low gravity and boiling-point, it must not be mistaken for the "benzin" of commerce, which readily affects pure balsam.

II. ACTION OF SOLVENTS.—This method of examination has a more or less definite relation to the constituents of the balsam, so that while indicating purity to a certain extent, a fair idea is also given of the quality of the balsam under examination. Without entering fully into the chemistry of the balsam, which is much in need of careful and thorough revision, it may be stated for convenience' sake that it is a mixture of cinnamëin (benzylic cinnamate), one or more resins, styracin (cinnamylic cinnamate) according to Delafontaine, and a small percentage of free cinnamic acid. As in all natural products the proportions of the constituents are not constant, it being, in fact, understood that the resins and free acid increase with age. In common with those who have given attention to this subject, the writer considered it important to determine (1) the proportion of the odorous principle (cinnamëin) in each sample, and (2) that of the resins.

1. *Determination of Cinnamëin.*—For this purpose a petroleum spirit of specific gravity 710, and boiling at 60–68° C., constant 65° C., was selected. This spirit dissolved out in addition to the cinnamëin a small percentage of cinnamic acid, but which, for expediency, was not separately determined. A weighed portion of balsam was treated with the solvent until nothing more was dis-

solved, five volumes to one of balsam being generally sufficient. The solution after careful filtration was evaporated until the loss was constant. The residue from pure balsam was of the colour and thickness of expressed almond oil, and varied in specific gravity from 1.085 to 1.100 (cinnamëin being 1.100). The odour was similar to that of pure balsam, but devoid of the peculiar empyreuma. The percentages obtained are recorded in the appended table. It may be convenient to state here that Flückiger and Senier state that pure balsam should yield from two-fifths to one half, while Schlickum gives 41 per cent. as an average. As to the effect which adulterants have on the yield of cinnamëin, the writer is not prepared to agree with those who have stated that copaiba and castor oil increase it by the weight of them present. The former is certainly soluble in the solvent, but when added to the balsam the relation between the two seems to be broken. Thus 10 per cent. of copaiba was added to a balsam which yielded 43 per cent. of cinnamëin, it then yielded 42 per cent. to the petroleum spirit, instead of the theoretical 48.7 per cent. ($43 \times \frac{9}{10} + 10 = 48.7$). Schlickum's statement that castor oil is completely soluble in petroleum spirit is based on incorrect observation. One part of the oil is soluble in one part of the spirit, but further addition of the latter throws out the oil. (See *Year-Book of Pharmacy*, 1876, 356). A balsam which yielded 49 per cent. of cinnamëin yielded 48.5 per cent. after 10 per cent. of castor oil had been added to it. According to Schlickum it should have yielded 54.1 per cent. ($49 \times \frac{9}{10} + 10 = 54.1$). It is evident, therefore, that the quantitative estimation of these adulterants, by first treating one part of balsam with the solvent, and then another part after saponification with lime, the percentage of adulterant being calculated from difference in weight of the residues, cannot be correctly effected. But a part of the adulterants passes into solution, so that the method is yet qualitative, and the same holds good with benzoin and colophony (alcoholic solutions), and storax. The petroleum spirit residue is reserved for subsequent examination, the nature of which is commented upon further on.

The portion of balsam insoluble in petroleum spirit was somewhat thicker than the original balsam, and evidently consisted of more than resin; the weight also was so different from the weight of resin separated by bisulphide of carbon, that it was thought advisable to treat it with that solvent. This was accordingly done in all cases, the solvent being added until all resin was separated, the clear solution filtered and evaporated. The residue was a pale

brown oily body, of the consistence of copaiba, and not unlike it in general appearance. Its odour more resembled storax than pure balsam. An alcoholic solution (which on slow evaporation crystallized to some extent) gave a copious precipitate with basic lead acetate. Treated with strong potash solution (alcoholic) in the water-bath for an hour, much hot water then added and excess of sulphuric acid, brown oily drops were deposited; the deposit was collected on a filter and well washed with hot water. It possessed a powerful hyacinth odour (such as styrone possesses), and dissolved completely in ether, being left on evaporation as a soft brown resin. The filtrate on cooling deposited silvery crystals, which were recognised as cinnamic acid. These results lead to the assumption that the residue was composed in part of styracin (cinnamyl cinnamate), which on treatment with strong alkali yields styrone and an alkaline cinnamate, and are merely recorded here for the purpose of throwing a little light on the nature of the substance.

The residue insoluble in bisulphide of carbon was treated with ether, which dissolved nearly the whole of it, what remained being principally woody matter and a little resin soluble in alcohol. The ethereal solution on evaporation afforded a hard brown odourless resin, soluble in alcohol, chloroform, and ether. The alcoholic solution gave a precipitate with basic lead acetate. The examination of it has not been extended owing to want of time.

2. *Determination of Resin.*—The method for this determination, which has always been adopted as a convenient one, has been to treat a weighed portion of balsam with three times its volume of bisulphide of carbon. The method was adopted in this case, and the results are recorded, but it must be pointed out that the insoluble matter bears no relation whatever to the amount of resin actually present, which is evident on comparing the third and seventh columns of "proportions dissolved by different solvents" in the appended table. According to "Pharmacographia," as much as 38 per cent. of resin has by this method been found in the balsam; and the U.S.P. has fixed 40 per cent. as a maximum. Schlickum has already pointed out that the resinous residue amounts at most to 16 per cent., and that an admixture of benzoin increases the insoluble portion; the writer's results are corroborative of Schlickum's observation. It is apparent that the U.S.P. has fixed upon too high a maximum, which might be profitably amended, since the test affords a good indication of the presence of benzoin.

In speaking of the petroleum spirit residue, it was remarked that it was subjected to examination. In the German Pharmacopœia it is stated that the residue should not have the odour of turpentine, storax, or copaiba, and that it should not give a blue or greenish blue colour with nitric acid (sp. gr. 1·300–1·330). This nitric acid test was designed by Doescher (*Phar. Zeit.*, 1881, p. 238) to detect the presence of storax and colophony. Grote (*Phar. Centr.*, xxiv. 179) finds that he can get the same coloration with the residue from a balsam free from these adulterants. As considerable variance of opinion has been expressed regarding the test, the writer has carefully experimented with it, with the following results :—

1st. If the petroleum spirit solution be not filtered, the suspended particles give the green coloration.

2nd. Nitric acid (sp. gr. 1·300–1·330) is quite different in its action from nitric acid B.P. (sp. gr. 1·420).

Using from 10 to 20 minims of the strong acid, placed in a porcelain dish, one minim of petroleum spirit residue being dropped on the surface of the acid, there was obtained in the case of *pure balsam* a pale green coloration *slowly*, the margins becoming violet, which colour darkened; the whole became chocolate brown on standing. *With weak acid the yellow colour darkened or became of an indistinct green.*

Balsam containing storax, a pale green coloration, which darkened to a decided opaque green. The coloration passed from green to brown on standing. *With weak acid, coloration same as pure balsam.*

Balsam containing benzoin, coloration same as pure balsam, but violet remained pale and bright, and extended over the surface. *Weak acid gave same as the pure balsam.*

Balsam containing colophony, immediate bright emerald green. *Weak acid gave slowly bright pale green spots on pale brown ground.*

Balsam containing copaiba, intense blue. *With weak acid, greenish blue.*

The coloration afforded by benzoin is not sufficiently distinctive to rank as a test; that by storax cannot be relied upon as indicating by itself the presence of the adulterant, as small percentages allow the distinctive violet of the pure balsam to assert itself; but if there be an absence of the violet, and the residue have the odour of storax, even in a faint degree, the adulterant is fully indicated. The colorations afforded by copaiba and colophony (or common resin) are exceedingly distinctive.

For the detection of fixed oil in the residue, should such an

adulterant be indicated by preliminary tests, it is treated with weak alcoholic potash, gently warmed on the water-bath and filtered, any oil present is thus saponified, and renders the filtrate quite milky; if a portion of the filtrate be acidulated with hydrochloric acid, there separates out in addition to the cinnamic acid minute oily globules, which float on the surface of the liquid. The soap may be also separated with saturated solution of common salt and decomposed by acid in the same way. One specimen of balsam, part of a very old stock, gave an abundant separation of oily globules after the residue was saponified and acidulated. It also gave a permanent soft paste with the lime test (alcoholic). None of the specimens reported on contained fixed oil.

In the appended table specific gravities, percentages of cinnamëin and resin are recorded, together with the proportions of matter taken up by carbon bisulphide alone, and after the balsam has been treated with petroleum spirit. These are not detailed as being direct proof of the quality of the balsam, but they tend to contrast the quality of the balsam so far as the cinnamëin content is concerned; thus, a balsam containing 42 per cent. of the odorous principle is good, but one containing 50 per cent. is better. It is noteworthy that the analogy between low specific gravity and high cinnamëin content is fairly well marked throughout, a circumstance to be expected from the specific gravity of the cinnamëin, and another proof of the remark that "the low specific gravity of recent years is quite consistent with the purity of a given sample" (*Pharm. Journ.* [3], xiv. 861).

No.	Source.	Sp. gr. 15° C.	PROPORTIONS DISSOLVED BY DIFFERENT SOLVENTS.							
			Petrol. spt.	C S ₂ .	Ether.	In- soluble.	Total.	With C S ₂ alone.		
								Soluble.	In- soluble.	Total
1	Retail pharmacists.	1.1456	46.40	37.66	11.45	4.40	100.00	86.23	13.50	99.73
2		1.1476	36.40	33.97	27.48	1.94	99.19	76.61	23.06	99.66
3		1.1440	44.54	29.02	24.45	1.99	100.00	87.00	13.83	100.83
4		1.1434	41.58	35.49	23.10	0.47	100.64	89.43	10.37	99.80
5	Wholesale house.	1.1400	48.71	25.78	24.35	1.67	103.41	87.67	11.63	99.29
6		1.1376	52.54	32.40	12.50	2.31	99.75	89.80	10.90	100.70
7		1.1412	50.63	27.87	21.27	0.53	100.30	90.65	9.34	99.99
8		1.1452	43.57	29.28	22.61	3.70	99.18	90.00	10.00	100.00
9	Shipboard.	1.1456	43.20	31.00	24.40	1.50	100.10	88.46	11.31	100.77
10		1.1420	49.18	25.94	22.97	1.46	99.67	88.67	10.63	99.30
11		1.1412	47.18	31.92	19.20	1.55	99.85	90.29	9.55	99.84
12		1.1416	43.23	37.50	17.09	1.91	99.73	89.18	9.91	99.09

Of these specimens all but Nos. 2 and 3 were above suspicion. No. 3 had been some years in stock, so that age would account for

the inordinate thickness which it possessed and the high percentage of resin. It failed to respond to the tests for impurities. No. 2, on the other hand, was a rather thick and muddy-looking balsam, which could scarcely pass as pure to the observant eye. The petroleum ether residue had a faint odour of storax, and when a portion of the specimen was rubbed up with lime, the specific odour of Peru balsam was quite covered by that of storax. As the mass which it yielded with sulphuric acid dissolved completely in ether, Schlickum's method for estimation of the percentage of storax present could not be tried. It is noteworthy that though this is the only impure specimen examined, yet its specific gravity is the highest. This appears anomalous, and can only be explained on the supposition that the specimen was very old.

In concluding, the writer has simply to state that the present supply of Peruvian balsam is of good quality, as far as he has been enabled to judge from the specimens obtained, and according to the method of examination adopted.

Mr. Plowman next read the following paper in abstract—

NOTE ON THE PRESENCE OF COPPER IN SOME PHARMACEUTICAL PREPARATIONS.

BY JOHN R. HILL.

The objects of the following note are to bring before the Conference a contamination of certain pharmaceutical preparations with copper, which, so far as I am aware, has not been previously observed, and to raise the question, What is the most suitable material for the construction of pharmaceutical apparatus employed in the manufacture of the preparations referred to?

It is the outcome of an incident which occurred in ordinary practice, and I have thought it would be an advantage to bring the subject under the notice of those whose experience and opportunities are such as may give rise to profitable discussion.

A considerable time ago I discovered that a sample of *infusum rosæ acidum concentratum* contained a quantity of copper sufficient to speedily coat a steel spatula which had been accidentally immersed in it. The infusion had been prepared in a jacketed copper pan, and this, no doubt, was the source of the contamination.

I started to make a quantitative estimation according to the following process:—200 grains of the infusion were evaporated to dryness and ignited. The residue was dissolved in dilute hydro-

chloric acid, and the copper precipitated in the metallic state by the addition of pure zinc. From want of time the process was not carried further, and the matter was allowed to drop. I have not had a convenient opportunity of making a quantitative estimation since, and I regret that I am therefore unable to give an exact statement of the proportion of copper present in any of the preparations to which I shall allude. Judging from the appearance of the precipitate, however, I should say that the proportion did not exceed, and was probably less than, 1 per cent.

A few months ago my attention was again directed to the subject by the following circumstance. While dispensing a prescription it was necessary to slightly evaporate a quantity of ergotin. A silver-plated spatula from which some of the plating had been rubbed off, was used to stir the mass, and it was observed that the steel surface thus exposed became covered with a distinct film of metallic copper. An examination of the ergotin showed that it contained a notable quantity of copper, which could be readily detected by any of the ordinary tests, and that it was present apparently in even larger proportion than in the infusion of roses above referred to.

Just at that time an interesting practical paper on "Pharmaceutical Apparatus" was read before the Liverpool Chemists' Association by Dr. Symes (*Pharm. Journ.*, vol. xiv. p. 783). In that paper jacketed copper pans are recommended, and this fact, coupled with the observations I have just mentioned, led me to examine a considerable number of pharmaceutical preparations in order to ascertain to what extent the use of such pans was the cause of the contamination which it is a purpose of this paper to point out. The result was to show that the vast majority of the commercial samples of concentrated decoctions, fluid extracts, and concentrated infusions so examined readily gave unmistakable indications of the presence of copper to a greater or less extent.

The iron test was the one generally employed, and was applied as follows:—200 grains of the preparation were placed in a test tube and slightly acidulated with hydrochloric acid. A 5-inch piece of recently polished No. 36 iron wire, in the form of a small coil, was immersed in the liquid, which was then gently boiled for about ten minutes; allowed to stand for another ten minutes, and the liquid poured off. If any appreciable quantity of copper was present it was at once detected as a deposit on the coil of iron wire, the copper colour being more or less distinct according to the respective extent of the contamination.

This simple and old-fashioned test seems to me to have several advantages. It is capable of ready and expeditious application; the presence of organic matter being no obstacle. Its indications are indisputable. It is sufficiently delicate for all practical purposes, and where it fails to give a perceptible indication, the preparation may be regarded as practically free from contamination. By exposing a constant surface of iron to equal weights of substance it is possible, from the colour of the cupreous deposit, to obtain a rough approximation to the relative degree of contamination.

The various preparations examined, with the result in each case may be conveniently tabulated as follows:—

Preparation.	Copper deposit.
Ergotin	Abundant.
Infus. rosæ acid. conc.	"
" chiretæ "	"
" cuspariæ "	Very distinct.
Ext. cinchonæ liquid	" "
Infus. cinchonæ conc.	Distinct.
Ext. ergotæ liquid	"
Infus. digitalis conc.	"
" senegæ "	"
Decoct. sarzæ co.	"
Infus. serpentariæ	"
Decoct. pareiræ conc.	"
Infus. gentianæ conc.	Less distinct.
Ext. sarzæ liquid	" "
Ext. taraxaci liquid.	" "
Ext. sennæ liquid	" "
Decoct. scoparii conc.	" "
Infus. Casarillæ "	" "
" calumbæ "	" "
" uvæ ursi "	Perceptible.
" quassiæ "	None.

The above is a graduated series, the ergotin indicating the largest proportion, and *infus. uvæ ursi conc.* the least. *Infus. quassia conc.* is included in the list because even when prepared in a copper vessel it does not indicate any contamination. It is probable that the degree of contamination in the above preparations may be due to accidental circumstances, and that were they all prepared under precisely similar conditions, the series would require considerable rearrangement. It would appear that substances containing principles belonging to the tannin group are most liable to contamination, while those containing neutral or comparatively

indifferent principles are less so. The very considerable contamination of ergotin is probably due to the phosphoric and other mineral acids present in the ergot.

It has been found by Dupré and Odling, Bergeron and Hote, and Kingzett that copper, in small quantities, is widely distributed in nature, and is a normal constituent of many vegetable and animal tissues. I may, therefore, be met by the objection that what is here called a contamination is, after all, nothing more than what has been called "normal copper." On this point it is sufficient to say that many of the samples of these preparations gave no indications of the presence of copper, and wherever it was possible to trace the manufacture of such as did indicate contamination, it was found that copper pans had been used in their production. It seems clear, therefore, that the copper is not inherent, but derived, and that the evaporating pan is the source.

It may be interesting to note that samples obtained from large manufacturers, possessing well-equipped pharmaceutical laboratories, frequently indicated contamination; while those obtained from smaller establishments, as a rule, did not. I believe this is to be accounted for by the fact that in the smaller establishments it is customary to conduct the process of evaporation in an ordinary enamelled iron evaporating basin heated by a Bunsen burner, while in the larger establishments jacketed copper pans, heated by steam, are in more general use.

In regard to the poisonous effect of copper, authorities appear to differ widely, as may be seen from the discussions which have taken place on the presence of copper in green peas and other articles of food (*Pharm. Journ.*, vol. viii., page 236). The conclusion arrived at by Paul and Kingzett as to the innocuous nature of traces of copper in foods appears to be too sweeping. The weight of evidence tends to show that copper is an irritant poison, and that while many appear to tolerate it even in considerable quantity, others are peculiarly susceptible to its poisonous effects.

In the case of ergotin there is a point of some importance which would probably be worth investigation. It is very frequently administered by subcutaneous injection, and in this way the copper is introduced directly into the blood. It has been found that some samples of ergotin are much more liable to produce local irritation than others when so administered, and it seems possible that this may be due to the presence of copper in the ergotin. I am acquainted with one make of ergotin in the production of which no copper vessels are employed, consequently it gives no indication

of contamination, and one of its principal recommendations is its freedom from liability to produce local irritation.

With regard to the sale of pharmaceutical preparations contaminated with copper, I quote the following remark by Professor Redwood (*Pharm. Journ.*, vol. viii., page 225): "He had come to the conclusion that no dealer or manufacturer was justified in supplying an article of food (or, by parity of reasoning, a drug) which contained an unnecessary addition of a poisonous substance without notice being given of its presence." This gives rise to an interesting speculation as to the probable result of a prosecution under the Sale of Food and Drugs Act.

Apart from this, however, the practical question naturally arises, Are copper vessels suitable for the processes involved in the production of the pharmaceutical preparations referred to? Or, to put it in a more comprehensive form, What is the most suitable material for the construction of such pharmaceutical apparatus?

To the first question I would be inclined to answer—No. The copper pans described in Dr. Symes's paper are only jacketed on the lower part, and he justly claims for them the advantage of not causing deterioration of the product by drying and destruction of active principles at the margin. They would probably have the additional advantage of not so readily contaminating the product with copper. I believe it is mainly at the margin, where the liquid, the metal, and the atmosphere meet, that contamination goes on. The drying of the liquid on the metal is attended by a certain amount of oxidation, and the oxide of copper thus produced is dissolved by a fresh portion of liquid. So much for the first question.

The second is not so easily settled, and I fear I must leave it to those who have a more extensive practical acquaintance with the subject. Copper vessels, tin lined, such as those described by Mr. Corder, of Norwich, in the *Pharmaceutical Journal*, vol. viii., page 349, might perhaps meet the difficulty. Silver, or some variety of nickel plating, may also be suggested. I believe that in one establishment block tin pans are in use. Best of all, perhaps, is the jacketed enamelled iron pan, described by Mr. Schacht, at the Plymouth Conference in 1877 (*Pharm. Journ.* vol. viii. p. 127).

Votes of thanks were passed to the authors of papers of which abstracts had been read.

The PRESIDENT, referring to the last paper, said the subject was a very important one, and deserved more attention than could be

given to it there at that late hour. It was a very curious thing that the author should find that ergotin was so active in dissolving copper. He should like to know if the ergotin was obtained by the usual process.

Mr. DOTT said this paper was very interesting; considering the poisonous nature of copper salts, it was very important that its presence in pharmaceutical preparations should be avoided. There was probably no other metal which could be used practically in large vessels for evaporating, and this indicated the necessity for the copper being coated with some material on which the organic acid would not act.

Mr. NAYLOR said all this difficulty might be avoided by using tinned copper pans, which were now becoming very general.

The PRESIDENT remarked that sometimes the tin got worn off a little.

Mr. PLOWMAN thought this was not the time or place to discuss the question whether the presence of copper was harmful or not, but he quite agreed with the author that copper ought not to be present in quantity in food and drugs. He could not agree with Messrs. Paul and Kingzett in their opinion that a considerable amount of copper could be taken into the system without doing harm.

GENERAL BUSINESS.

BELL AND HILLS LIBRARY FUND.

Mr. PLOWMAN said the books provided by the Bell and Hills Fund were placed on the table. The fact had already been alluded to that the visit of the Conference had caused a chemists' association to be formed in Hastings. He might say that when he came down on previous occasions to make arrangements, he found that a local association had been conceived, but it was not actually born. But it only required a slight stimulus from the visit of the Conference to cause the association to spring into life. These books were given from a fund provided by the generosity of Mr. Thomas Hyde Hills. There were also the "Pharmacographia" and the "Science Papers," presented by Mr. Thomas Haubury in memory of his brother, and besides these there was the "Year-Book of Pharmacy," which the Conference itself granted to the new association, and would continue to send from year to year.

The **PRESIDENT**, addressing Mr. Rossiter and the members of the local Association, said it gave him great pleasure in his official capacity to hand over this handsome array of books to the keeping of the new Association now being formed in Hastings, and he hoped that they would form a nucleus for that instructive library which he had no doubt would be established.

Mr. F. ROSSITER, on behalf of the Hastings Chemists and Druggists' Association, begged to return most sincere thanks for this handsome set of books. In the first place thanks were due to the Conference for having been the means of establishing an association to which alone the grant could be made, and further he might say the chemists of Hastings should almost pass a vote of thanks to the British Association for going to Canada this year, for had its meeting taken place in any town in Great Britain, Hastings would not have had the distinguished honour of the Pharmaceutical Conference meeting there. He could only say with regard to the active part which Mr. Plowman had been kind enough to give him credit for in the formation of the Association, that he must disclaim having exceeded in any way what had been done by several other members, especially Mr. Bell. For some time there had been a talk of forming an association in Hastings—and it must seem strange that an ancient town, which in times past had shown such energy and spirit, had, so far as regards pharmacy, allowed other towns to lead the way. He must admit that for some time they had been living in a sort of fossil state, not perhaps quite so petrified as the fossil to which Mr. Keyworth had referred that morning, but ready to spring into active existence at the touch of the magician's wand, such as was furnished by the visit of the Conference. These handsome books would form a nucleus of a library, and he was sure it would be a pleasure to all the members to make additions to it as time went on, and they would at all times, looking at these books, feel a great incentive to do what they could for pharmacy and for their brother pharmacists, and would be reminded of this happy occasion.

PLACE OF MEETING FOR 1885.

Mr. BENDER said it would be remembered that the Conference had received an invitation to go to Aberdeen this year, which was withdrawn because the British Association proposed to meet there next year. That invitation had been very cordially renewed, and

he had a letter from Mr. Strachan, Honorary Secretary of the Aberdeen Society, which he would read. Mr. Kay had come all the way from Aberdeen to offer personally a renewal of the invitation, but Mr. Kay wished him to read a letter which he received from Mr. Strachan a few days ago. It was as follows:—"I expect Mr. Kay will be present at your Conference, but if he is unable you will understand that our invitation is none the less hearty because it is in black and white instead of *viva voce*. Our endeavour will be to make the meeting as interesting as we possibly can.—Yours truly, H. STRACHAN."

Mr. KAY begged to thank the meeting very much for the warm reception given to this proposal. He did not know if this expression of feeling was due to any merits Aberdeen might possess, or to the present state of the atmosphere, which made them all feel that it would be pleasant to get a few degrees nearer the North Pole—which they certainly would be in crossing the Grampians. He felt that Aberdeen as a watering-place had no such attractions as Hastings and St. Leonards, but it was an ancient university city and claimed to be the capital of the North of Scotland. It had one advantage over Hastings, a Chemists' Association had been established in Aberdeen for nearly fifty years. This association had been of great advantage to the chemists, and had done very good work in the district, if it had not made its name known in the south. A few of the original members, who assisted Jacob Bell in the formation of the Pharmaceutical Society, were looking forward to meeting many who were associated with them in this great work. This Conference had given him an opportunity of meeting a few old friends and many gentlemen, also, who were only known to him previously by reputation. He knew it was the desire of the chemists in the north to make the acquaintance of gentlemen eminent in their profession, whom they highly respected for their efforts in forwarding the interests of pharmacy. The medical profession in the district were also interested in and looking forward to the visit of the Pharmaceutical Conference. He need not repeat that it would be a very great pleasure indeed to see as many as possibly could come, and they would try to make the visit as pleasant as possible.

Mr. BENDER moved that the kind invitation received from Aberdeen be gratefully accepted. They had had very pleasant meetings in some of the Scotch cities and towns before, and he was sure they would look forward very much to this visit next year.

Mr. PLOWMAN seconded the motion.

The PRESIDENT said the time would be fixed hereafter, when the exact date of the meeting of the British Association was known.

The resolution was then carried unanimously.

ELECTION OF OFFICERS.

Mr. RADLEY and Mr. CLARK were appointed scrutineers of the ballot papers.

The PRESIDENT said it would be observed that certain alterations of a very serious character had been made in the list of officials ; he alluded more especially to the fact that the Conference was about to lose one of the Honorary General Secretaries who had been for so many years connected with them, Mr. Bengier. It was with great reluctance that the Conference heard that Mr. Bengier could no longer fulfil the duties of the office. Dr. Thresh had been named as a substitute, and he had no doubt he would prove a most efficient one, but he must say personally he was very sorry the change had occurred during the time of his presidency. Misfortunes never came alone, and not only did Mr. Bengier retire, but their old and tried friend, Mr. Ekin, who had been Treasurer for the last seven years, also found it impossible to continue to carry out the duties of his office as he would wish, and it was his desire also to retire. This was an office which, perhaps, could be filled more easily than that of General Secretary, whose work extended over a much longer period than that of Treasurer, whose duties were really confined to a short period, whereas the General Secretary required constant energy and attention throughout the whole year. It would be for the members present to say if they would elect the gentlemen suggested, viz., Mr. Umney as Treasurer and Dr. Thresh as Secretary. In the meantime he could only express the great regret which he himself felt at the loss of these two gentlemen, who had so worthily filled those two offices, and he begged formally and emphatically to move a vote of thanks to these gentlemen for their services to the Conference in past years.

Mr. SCHACHT said he felt it a great privilege to be allowed to second this vote of thanks. These gentlemen were amongst his oldest professional friends, and it gave him great pleasure to second this motion. It would have been much more pleasing if one could have thanked them for their past services before they altogether got out of harness ; but unfortunately one had to say good-bye at the same time, and the satisfaction of saying "thank you" was sadly mingled with regret at the necessity for parting with such excellent

fellow-labourers. Whilst Mr. Benger was Honorary Secretary one felt there was no occasion to think about the details of the business arrangements, for the Conference was almost certain to go well, wherever it was held, so long as he and his colleague had the direction of affairs, and the other members of the Committee felt relieved of a great deal of responsibility. Notwithstanding the abilities of Dr. Thresh, who was proposed to succeed him, he felt they must all be a little more anxious in future as to the success of the meetings, and it would become more the duty of every individual member to exert himself than in the past. There were men who were respected and men who were loved, and it was just possible that the latter were the most powerful in all organisations that aimed to control human beings. Both Mr. Ekin and Mr. Benger were men of this order, and, though thanking them warmly for their services in the past, he could not help expressing real sorrow that the Conference was about to lose them for the future.

Mr. PLOWMAN said he could not allow the opportunity to pass without saying a few words. With regard to the general loss which the Conference had sustained by the retirement of these two gentlemen, he need not add one word to what had been said, but he should like to say a few words on the personal aspect of the question. When he took office three years ago it was with considerable diffidence, but his hesitation was entirely removed after a brief experience of his colleagues. The cordial way in which Mr. Benger met and helped him, and actually took on his own shoulders burdens which properly belonged to him (Mr. Plowman) was such that he was happy to say he had been able to do his share of the work with very little trouble and inconvenience to himself. They had worked together with the most complete harmony during the whole of this time, and he was pleased to say that their intercourse on Conference business had more closely cemented a friendship which had previously existed, and which he hoped would last as long as life itself.

The resolution having been carried unanimously,

Mr. BENDER said he was quite overcome by the kind things which had been said about him. Only one thing would have added to his gratification, and that would be a knowledge that he had better deserved what had been said. The mere fact of his having served rather actively as a Secretary a body which had done so much to advance pharmacy and to promote good feeling and good fellowship amongst pharmacists was in itself a full reward. This he had constantly realized as the work went on. He looked forward with

confidence to the future Conference, so long as his energetic and accomplished friends Mr. Plowman and Dr. Thresh were at the helm; but should always look back with very much pleasure to the thirteen years in which he had served it to the best of his ability.

The Scrutineers here returned and reported that the following gentlemen had been unanimously elected :—

President.—J. B. Stephenson, Edinburgh.

Vice-Presidents.—F. Baden Bengier, F.C.S., Manchester; M. Car-teighe, F.I.C., F.C.S., London; C. Ekin, F.C.S., London; J. P. Kay, Aberdeen.

Treasurer.—C. Umney, F.I.C., F.C.S., London.

Honorary General Secretaries.—S. Plowman, F.I.C., M.B.C.S., London; J. C. Thresh, D.Sc., F.C.S., Buxton.

Other Members of Executive Committee.—S. R. Atkins, Salisbury; J. A. Bell, Hastings; J. Borland, F.C.S., F.R.M.S., Kilmarnock; J. E. Bruncker, M.A., Dublin; W. Hills, F.C.S., London; D. B. Dott, F.R.S.E., Edinburgh; W. A. H. Naylor, F.C.S., London; J. Sim, Aberdeen; W. H. Symons, F.C.S., F.R.M.S., London.

Local Secretary.—A. Strachan, Aberdeen.

Auditors.—A. I. Joseph, Hastings, and J. Paterson, Aberdeen.

Mr. ATKINS then moved—

“That the cordial thanks of the non-resident members of the British Pharmaceutical Conference be given to the Local Committee, especially to Messrs. Bell, Rossiter, Keyworth, and Joseph, for the very successful manner in which the arrangements connected with the Hastings visit had been carried out.”

He was almost afraid to add anything for fear of weakening the force of this well-drawn resolution. It would be ungenerous to allow those services which had been so generously and courteously rendered to be acknowledged in a mere formal manner. The Local Committee had had the good fortune of having good weather; whether they had taken any special pains to secure that he did not know, but they certainly had had a meeting which he ventured to think would go a long way to solve the still open question as to whether a good meeting could be realized apart from the visit of the British Association. That was a question on which there would be perhaps a diversity of opinion, but in so far as the action and

co-operation of the Local Committee were concerned, there could be no doubt whatever left. He felt that this resolution was slightly premature, inasmuch as some of the social features of the gathering had yet to be realized, but inasmuch as gratitude had been defined as a lively sense of favours yet to come, there would be no inconsistency in passing the resolution at this early stage. He knew personally how indefatigable had been the energy of the gentlemen whose names had been mentioned, and he had no doubt that the others associated with them had been equally zealous. Those who had come some distance to the meeting felt under great obligations to them, and he begged to assure them that he represented the opinion of all non-resident members in thanking them, however inadequately, for their kindness.

Mr. WELLS (Dublin) had great pleasure in seconding the vote of thanks, though anything he might have said in support of it had already been anticipated by Mr. Atkins. With regard to the success of the meeting, he thought this year's was hardly a fair specimen, because there had been several conferences held within the last few weeks, but for which two other gentlemen from Dublin would have accompanied him. He begged to heartily thank the Local Committee for the way in which the Conference had been received.

The resolution having been carried unanimously,

Mr. J. BELL, in response, said as they had yet the social aspect of the question to look forward to, it would be far better for him to leave the expressions he might wish to give until afterwards.

Mr. F. ROSSITER said he was not prepared for this vote of thanks, as he felt all through that the Conference had done the town a great honour in coming, and he could safely say for the whole of the Committee that it had been a work of great pleasure to them. So far from it being any trouble, it was only a little pleasurable excitement, and if there had been any little error or forgetfulness, he hoped it would be kindly excused.

Mr. KINNINMONT then moved—

“That the hearty thanks of the Conference be accorded to the President for the very able and courteous manner in which he has conducted the business of the meeting.”

He said with regard to his ability there could not be two opinions, and as to his courteousness, no one could surpass him in such a position. From the time he first took his place until the present

moment, he had distinguished himself for his kindness, ability, skill in saving time, and saying exactly what should be said. His address, which had before been referred to, was most valuable, and he had remarked on this as on previous occasions when he met Mr. Williams, how courteous he was in listening patiently to all the remarks which were made, many of which must seem a great repetition to him, but that did not prevent him listening to them patiently once more.

Mr. TYLER seconded the vote of thanks. He said reference had been made to the social qualities of Mr. Williams, and though his personal acquaintance with him was of somewhat recent date, from what he had heard and seen, he could most emphatically endorse all that had been said. Mr. Williams was one of the few men who cultivated the art of speaking the absolute truth in the pleasantest possible way. He spoke with the air of a man who believed all he said, and his words carried conviction with them. The effect left on his mind was that when Mr. Williams should have ceased to actively exert an influence—a great personal as well as a great scientific influence based on his experience and reputation—it would be thoroughly understood that all the encomiums passed upon him certainly fell short of the truth. With regard to the introductory address, they had been reminded that it was a return to the good old practice. He was not at all sure that it was so, for there were disadvantages in having a mere hash up of what everybody knew, as he was bound to say some of the presidential addresses had been; but he very much doubted whether all or any of them recollected or had read or knew all the facts which Mr. Williams brought within a narrow and clear compass in such a way as those who had any memory at all, or any scientific recollection, or any scientific use of the imagination, would ever retain a vivid impression of. It was a most valuable and suggestive address. There were two or three points in it which had brought back to him scattered recollections of good resolutions which they all knew paved the road to a certain place which might be the Hades of the destruction of fortune, or loss of one, and when a man of Mr. Williams's experience gave a youngster like himself, who sometimes wanted them, hints of this kind, he was profoundly grateful to him, and judging that other people were like himself, he could only suppose they would sympathize with him, and cordially support the expression of gratitude he personally felt for the suggestiveness and appropriateness of that address. With regard to the way in which Mr. Williams had filled the post of President of the meetings, he

only regretted that what seemed to have been a common practice, to re-elect the President for a second year, had not been followed in his case, and he presumed there were reasons why Mr. Williams could not be prevailed upon to continue office as so many eminent men had done before. He knew none of them except Mr. Reynolds and Professor Attfield, and therefore he might be excused if he said emphatically that he only knew of them as historical pharmacists, and by the work they had done, but none of them stood higher in the estimation, either of pharmacists or of practical men, than did Mr. Williams.

Mr. FRAZER said having sat for ten years side by side with Mr. Williams at the monthly meetings of the Council of the Pharmaceutical Society, he could not refrain from adding just a word to say how deeply he sympathised with what had been said, and what gratification it had given him to be present during those two days.

Mr. ATKINS also desired to support the resolution. He felt it would be a great neglect if they allowed such services as the Chairman had rendered to pass without a very warm and widespread recognition. He had known Mr. Williams many years on the London Council, and could bear testimony to all that had been said as to his straightforwardness, and to his great liberality, a feature perhaps which had not been recognised, for only those who knew something of his private life knew the generous acts of liberality he was constantly rendering. He entirely agreed with previous speakers as to the kindly way in which he listened to all criticisms, whether relevant or irrelevant; all that they knew, but he was glad to have this opportunity of bearing testimony to the weight of the words uttered yesterday in the President's address. The highest compliment they could pay to it was to read it carefully and to well weigh it, for he felt sure that all those utterances would bear frequent reperusal. That address was not simply a *résumé* of great and extensive reading, of large and very wide personal observation and experimental work, but it was the result of long, patient digestion of the works of a vast field of inquiry, and he took it as a high compliment to the members of the Conference that a man like Mr. Williams, so busy and full of work, should have taken pains, thoughtfully and deliberately, to prepare that address for their consideration.

Mr. SCHACHT said the motion of course could not be put from the chair, and therefore as the senior Vice-President he would assume that function. At the same time he wished to say how completely he agreed with every word of approbation that had

been said with regard both to the President's address and his conduct in the chair. It might be thought to be a perfectly easy thing to sit in a chair and to conduct a meeting like that, and he was foolish enough to think so himself until he found by experience how much more difficult it was than it appeared to be. He had never seen the meetings of the Conference conducted with more courtesy, delicacy, and tact, than the present. With regard to the address, it seemed to him to be a masterpiece of judicious exposition and thought; although it touched on some delicate and serious matters, it carefully avoided any extreme expression of opinion, such as might be calculated in some quarters to raise opposition. That reticence of expression and self-restraint he thought showed more power than more vehement language would have done. He was sure the proposition would be carried by acclamation.

The resolution was carried by acclamation.

The PRESIDENT, who was much affected by the warmth of the reception accorded to the resolution, said: Gentlemen, I thank you. To say that I could listen unmoved to such expressions would be affectation.

THE EXCURSION.

On Thursday morning a party of about one hundred ladies and gentlemen left the Castle Hotel in four-horsed breaks and other vehicles, which proceeded along the beautifully wooded road to Battle Abbey. Arrived there, a guide accompanied the party through the different parts of the Abbey and grounds, and his description of the Battle of Hastings was kindly supplemented and to some extent contradicted by a lucid statement from Mr. Thomas Horsham Cole, a local antiquary. Whilst the party was passing through the beautiful library, the Duke of Cleveland entered and gave a most courteous welcome. From Battle the company proceeded to Ashburnham, where they were admitted to the rare privilege of seeing the famous artistic, literary, and other treasures of that mansion, many of them specially associated with the Stuart kings, and of strolling through the beautiful gardens and grounds.

Normanhurst was next visited, but before venturing upon the inspection of the wonderful collection of curiosities accumulated there by Sir Thomas Brassey and his lady, the company lunched together in the tennis court. After lingering about this beautiful spot till the last moment, a rapid drive brought the company back to Hastings, and within half an hour many of them were travelling as fast as steam would allow to all parts of the kingdom.

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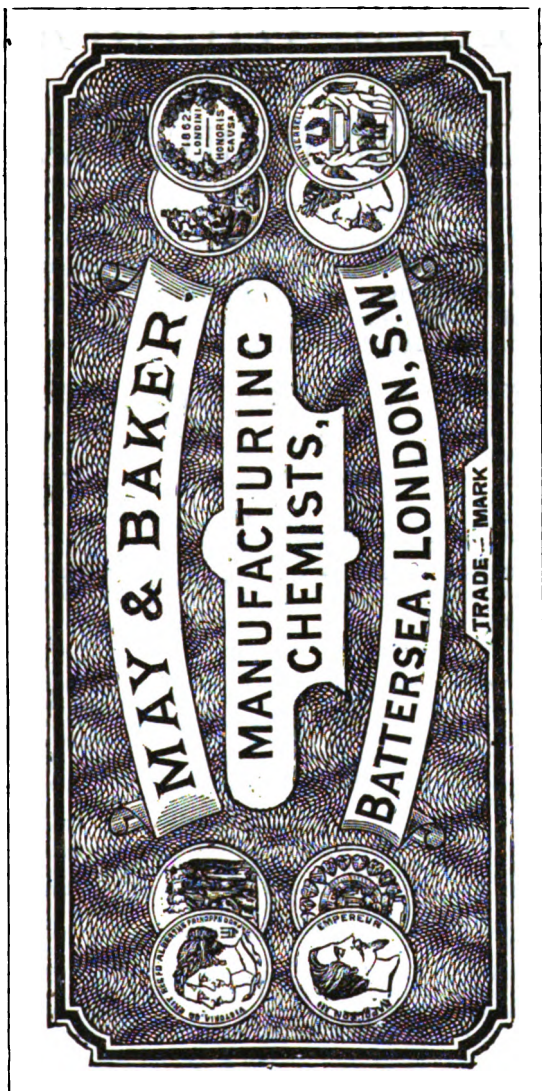
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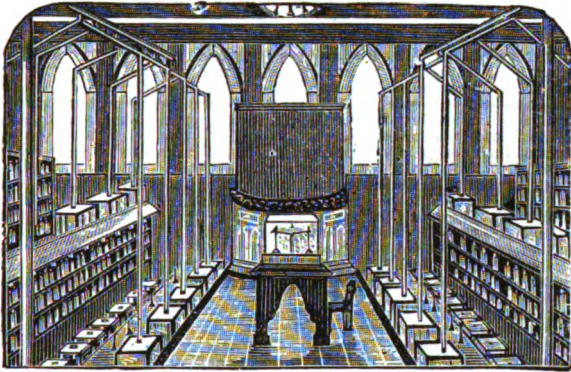
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Directors.—Messrs. LUFF & WOODLAND.

Lecturer on Chemistry.—Mr. A. P. LUFF, B.Sc. (Lond.) F.I.C., F.C.S., F.I.S., Late Demonstrator of Chemistry at St. Mary's Hospital, Pereira Medalist, etc.

Lecturer on Botany, Materia Medica, & Chemical Physics.—Mr. J. WOODLAND, F.I.S., F.C.S., Fellow of the Royal Botanic Society, Member of the Society of Chemical Industry, etc.

Demonstrator of Chemistry and Pharmacy.—Mr. J. F. BURNETT, M.P.S.

SESSION 1884-1885.

The Session extends from September 2nd to July.

The Proprietors of this School, who have long had practical experience in teaching, not only by giving Lectures but by examining the work of each Student individually, are assured that, if the information imparted is such that it will prove of permanent benefit to Students in their future career as Pharmacists, and will enable them to pass their examinations with credit, those under their tuition appreciate the system, and recognise the fact of its superiority over others.

The system of instruction is so arranged that great pains are taken to make every one who undergoes a course of tuition at this School understand the various subjects, and also to enable each one individually to shape his answers in a clear and definite form.

More Students from this School have passed the examinations during the past than in any preceding year, and as the maximum number that the school can hold has been uniformly kept up, the Proprietors have deemed it advisable to increase the School accommodation. The School now comprises, in addition to the Offices, a Chemical Laboratory for Minor Students, a Chemical Laboratory for Major Students, Lecture Room, Dispensary, and Students' Room, containing the materia medica, pharmaceutical, chemical, and botanical specimens.

In issuing this their Eighth Annual Prospectus, the Proprietors beg to assure all those who may place themselves under their tuition, that no effort shall be wanting to maintain the high reputation that the School has now acquired; their attention will be as unremitting as heretofore, and they trust that by the co-working of Teachers and Students in a thorough manner the continued success of the latter will be arrived at. One thing intending Students are particularly asked to bear in mind, and that is, they will be expected to work, and to work conscientiously, not merely skimming the surface of a branch of knowledge, but reasoning out the why and the wherefore; and this is where a Teacher's aid is so often necessary to enable facts to be understood and remembered, and the Teachers will be only too glad to render such assistance as will ensure the work being done in a thorough manner.

Another fact may also be added, and that is that almost every one of the Students of this School comes through the recommendation of others who have been before and experienced the mode of teaching, so that lengthy advertisements or circulars are not used by the Proprietors as a means of influencing candidates for the Minor or Major examination to prosecute their studies at this particular School. For the list of Students who have passed from this School, reference can be made to the advertisements in the *Pharmaceutical Journal*.

In conclusion, if Students work steadily and well, regularly attending the Lectures and Classes, and diligently taking notes, the Directors can honestly assure them that they cannot fail to pass the examinations before them with credit, and also acquire an amount of information extremely useful in after life.

The work of the Session is divided into three complete Courses of Lectures and Classes; one commencing on September 2nd and terminating at the December Examinations; another commencing the beginning of January and terminating at the April Examinations; and the third extending from April to the July Examinations.

The School premises, situated in Marylebone Road, are close to the Edgware Road and Baker Street Stations on the Metropolitan Railway, and omnibuses pass the School frequently.

A Register of Lodgings is kept at the School for the convenience of Students wishing to obtain Apartments.

CLASSES ON PRACTICAL BOTANY

Are held every week, at which Flowers, Fruits, etc., are provided for Dissection. All Students of this School have admission to Botanic Gardens.

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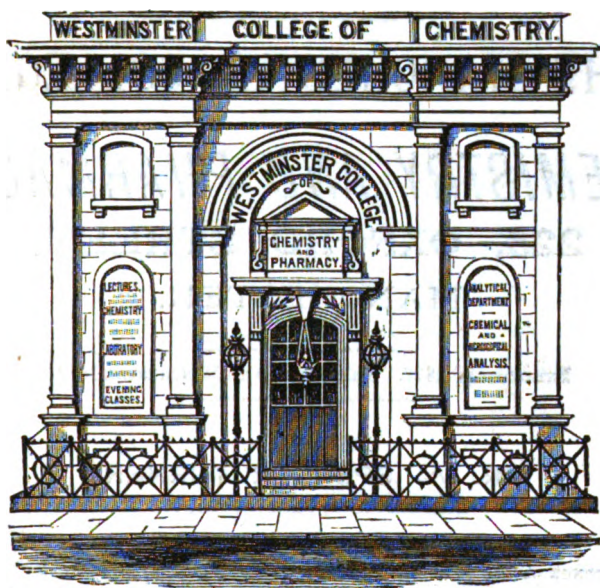
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One month, £4 4s.; two months, £7 7s.; three months, £9 9s.; the entire session £21. Students wishing to attend the Classes on Chemistry and Physics only, can do so by payment of £1 1s. per month.

Students wishing to enter their names, and for further particulars, are requested to apply to
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DIRECTOR:
MR. W. SPENCER TURNER,
Pharmaceutical Chemist, etc., etc.

Mr. TURNER wishes it to be distinctly understood that it is his ambition to conduct a GOOD School rather than a BIG one; and that while he will spare no pains to help those who wish honestly to study the subjects required in the examinations of the Pharmaceutical Society, he will not try to aid those who desire to gain evanescent surface knowledge in an impossibly short time.

The system of the school is that of small classes, with personal supervision of all work. Chemistry, Dispensing, Botany, etc., are made as practical as possible, every student working independently at his own bench; all apparatus, chemicals, and drugs being provided by the school.

The time-table is so arranged that all the different classes receive due attention, and every student can make steady and safe progress.

The Minor and Major classes are conducted by Mr. Turner and his assistant. The Preliminary classes are in charge of a visiting master.

The time-table includes three distinct sets of classes for the *minor*, viz., "Full Time," "Afternoon," and "Evening."

Two distinct sets for the *major*, viz., "Full time," and "Evening."

Two distinct sets for the Preliminary, viz., "Afternoon" and "Evening."

Full particulars of the School are given in the circular, which will be sent free to any address on application.

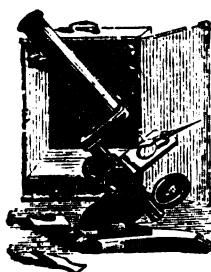
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They were introduced to the medical profession by the present proprietors more than thirty years ago, and many thousands of unsolicited testimonials have been received from the highest medical authorities, and are now used, and have been used for many years past, by the largest and best conducted hospitals and dispensaries. Of course a success like this has led to many imitations, and highly varnished pills, made to resemble ours, have been introduced by some unscrupulous people. Many of these pills pass through the stomach unaltered, and a useful invention is thus likely to be brought into disrepute.

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Any Pills can also be obtained from any Wholesale Druggist. In ordering, please specify "Cox's Tasteless Pills."

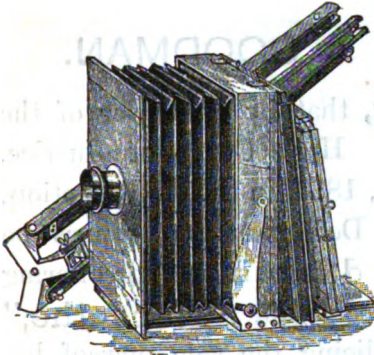
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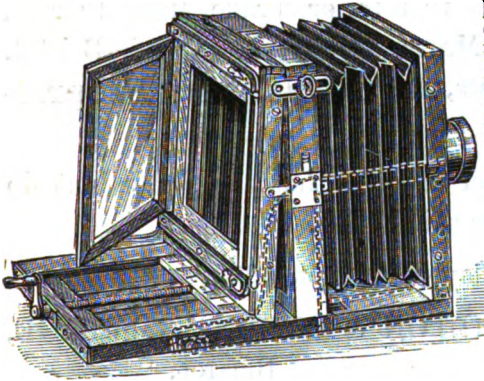


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NEPENTHE.

FERRIS & CO. *v.* GOODMAN.

Notice is hereby given, that by an Order of the Chancery Division of the High Court of Justice, made the 18th day of July, 1884, in the above action, it was ordered that the Defendant and others be **perpetually restrained** from selling, or offering for sale, any formula or recipe for "**Nepenthe**," and from otherwise prejudicing the sale thereof by, or injuring the title thereto, or Trade Mark therein, of the Plaintiffs, Messrs. FERRIS & Co., of Bristol, Wholesale Druggists, the **Registered Proprietors thereof**.

And it was further ordered that the Defendant do pay the costs of the said action.

Dated this 12th day of August, 1884.

(Signed) CHILTON & GREEN-ARMYTAGE,
BRISTOL,
Solicitors for the said Plaintiffs.

Wholesale and Export Terms for **NEPENTHE** sent upon application to

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PHARMACEUTICAL CHEMISTS will use this in preference to the **ZINCO OXIDUM** of the Br. Ph. 1867, which is a return to the process of the Pharmacopoeia of 1836, being a roasted carbonate as a substitute for the pure Oxide.

HUBBUCK'S PURE OXIDE is made by sublimation, and is warranted to contain upwards of 99 per cent. of Pure Oxide: in fact, the impurities are not traceable.

*Extract from "Pharmaceutical Journal" of May 1, 1856,
page 486.*

TRANSACTIONS OF THE PHARMACEUTICAL SOCIETY OF LONDON.
Wednesday, April 2nd, 1856.

"On Pure Oxide of Zinc for Use in Medicine."

"Mr. REDWOOD directed the attention of the meeting to the very beautiful specimen of oxide of zinc on the table, which had been presented by the manufacturer, Mr. Hubbuck. Some of this oxide had been submitted to him for chemical examination, and finding it to be remarkably pure, and to possess in a high degree all the chemical and physical qualities required in oxide of zinc intended for use in medicine, he had suggested to Mr. Hubbuck that it might be brought under the notice of the Society.

"The specimen of oxide of zinc on the table was not only free from all impurities, but it possessed the other qualities required. It was a perfectly white, light, and smooth powder.

"Mr. HUBBUCK stated that the oxide of zinc which his firm made for use in medicine was free from impurities commonly occurring in the oxide made by combustion. The zinc was first thoroughly refined, and all the lead, arsenic, cadmium, iron, and other impurities removed. The pure oxide was then produced by combustion, abstracting only the very finest part of the product for medicinal purposes. About one-tenth or one-twelfth of the whole was thus set apart in producing that from which the sample exhibited had been taken; and this could be done, since their usual operations requiring them to make several tons of oxide every day, they could separate as much as was required in a state of absolute purity, while the remainder would be equally valuable as a pigment.

"The CHAIRMAN thought the mechanical condition of substances used in medicine was often a matter of considerable importance, and ought to be considered as well as their chemical composition. He thought the specimen before the meeting was a very perfect one in every respect, and he had no doubt it was the sort of oxide of zinc best adapted for use in medicine."

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MACKEYS' MIST. BISMUTHI COMP. (Registered). Tonic Digestive.

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Anodyne, astringent, antispasmodic, diaphoretic, sedative, in perfect combination, is miscible with water in all proportions, does not separate, and is most convenient for dispensing. 5s. per lb.
Dr. M. Brown writes:—"I and my people like your CHLORODYNE very much; it is far superior to any other maker's."

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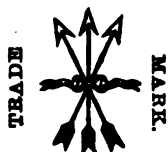
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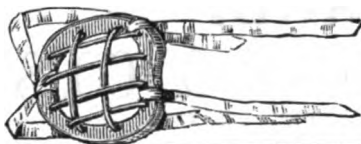
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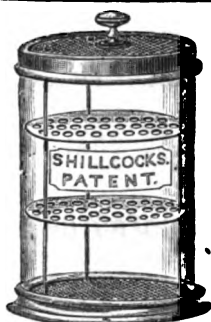
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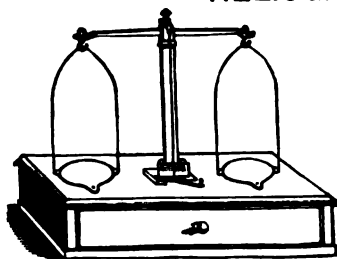
"REDLAND, BRISTOL, March 10, 1867.

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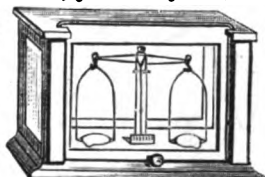
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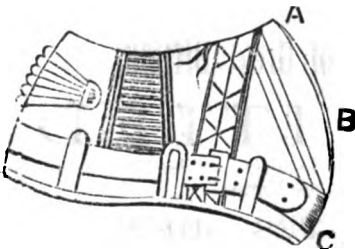
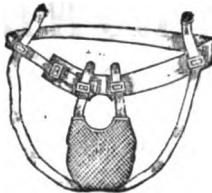
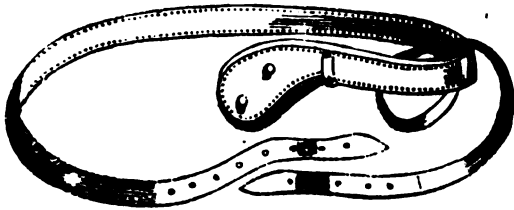
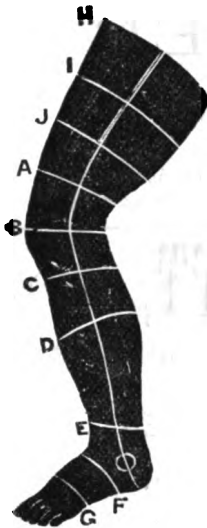
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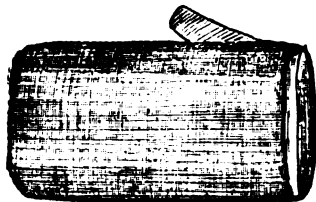
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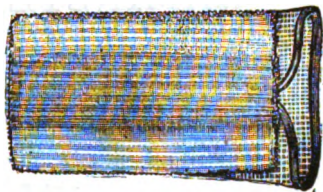
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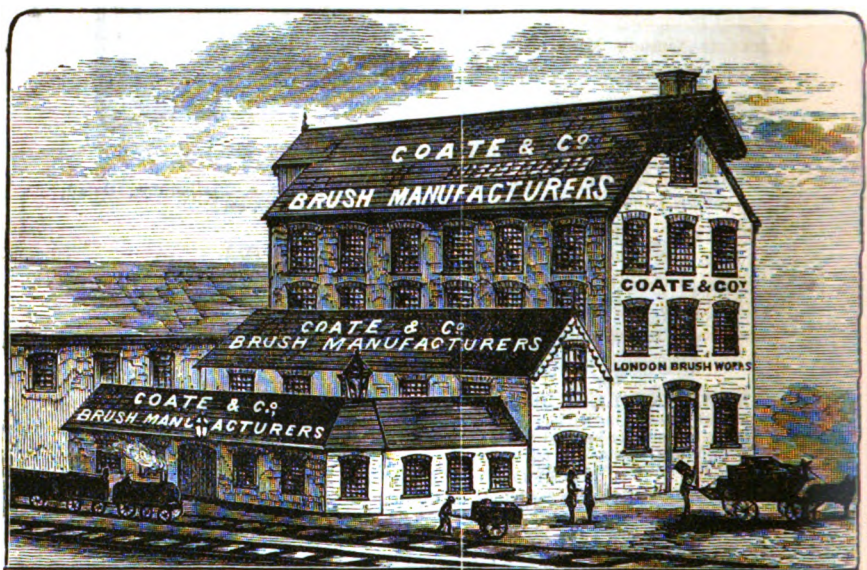
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But in all cases where Brushes are required to be stamped with Customer's name, orders will be received and executed through MESSRS. BARCLAY & SONS, or by COATE & Co. direct, with as little delay as practicable.

On every Wednesday and Saturday COATE & Co. send to their London Agents per tonnage rate whatever orders they have ready to CARTER, PATERSON & Co., Carriers, Goswell Road, London, who deliver each order free of cost in London to whatever wholesale House, Carrier, Railway or Shipping Agent their customer may order their goods to be sent by; and goods ordered to "wait instructions for forwarding" will, when such order is completed, be sent to the Carriers, CARTER, PATERSON & Co., LONDON, and the invoice, with post card enclosed, sent to customers on the same day as the goods are sent off to London. COATE & Co. therefore beg customers, on receipt of invoice, to advise CARTER, PATERSON & Co. by what means they are to forward the Goods on to them.

With these increased facilities they hope still further to merit a continuance of the favours bestowed on them for so many years past; and of those who require but have not got the Best made Tooth Brush we respectfully solicit a small trial order for comparison against any other makers' Tooth Brushes in the world for style, finish, durability and reasonableness of price.

WANTED.—Special Wholesale Agents for Calcutta and Bombay, Madras and Ceylon, New York and Chicago.

N.B.—LATE OF 41, LISLE STREET, LONDON.

EWBANK'S ROYAL PLATE POWDER, For Silver and Electro Plate.

6d. and 1s.

F. EWBANK (Plate Powder Manufacturer,
GOSWELL ROAD, LONDON.

GOLD MEDAL, ADELAIDE, 1881.



JOSEPH PICKERING & SONS, Albion Works, Sheffield.



RIMMEL'S NEW SANITARY PERFUMERY.

RIMMEL'S AROMATIC OZONIZER, a fragrant powder which, simply spread on a plate in apartments or places of public resort, evolves the refreshing and healthy emanations of the Pine and Eucalyptus, and produces a quantity of *Ozone*, the great air purifier. Its clean and portable nature renders it far preferable to liquid disinfectants. In 4-oz. Tins, 1s.; 1-lb. Tins, 3s. 6d.; Spreading Plate, 6d.

RIMMEL'S OZONIZED EAU DE COLOGNE, LAVENDER WATER, or FLORIDA WATER, sprinkled on a pad hung up in the air, destroys bad smells and noxious effluvia in sick rooms, closets, etc. Price 2s. 6d. and 6s. per Bottle; Pad, 1s.

RIMMEL'S AROMATIC OZONIZED POCKET CASSOLETTES, to preserve from infection, 6d. Sent by Post for 7 Stamps.

N.B.—600 detailed prospectuses, containing certificates and testimonials, sent with name and address to every purchaser of 3 dozen Aromatic Ozonizer, 1s. size.

SOLD BY ALL CHEMISTS AND DRUGGISTS. THE USUAL ALLOWANCE TO THE TRADE.

EUGENE RIMMEL, PERFUMER TO **H.R.H. THE PRINCESS OF WALES, 96, STRAND, LONDON.**

HELIOTROPE SACHET POWDER.

A very pleasant and lasting perfume.

Wholesale, in $\frac{1}{4}$ -lb., $\frac{1}{2}$ -lb., 1-lb. Bottles, at 14s. per lb.

HALL'S WOOD VIOLET PERFUME

PATRONIZED BY

HER ROYAL HIGHNESS THE PRINCESS OF WALES.

HER ROYAL HIGHNESS PRINCESS CHRISTIAN, ETC.

Retail at 1s. 6d., 2s. 6d., 4s. 6d., 8s. 6d., 10s. 6d., and 21s., etc., per Bottle.

PROPRIETOR—**E. R. BIGGLESTON**, Chemist, CANTERBURY.

Oakey's Silversmiths' Soap.

(Non-Mercurial.)

The best and cheapest article for cleaning and polishing without waste or dirt, silver, electro-plate, Britannia metal, tin, zinc, plate glass, marble, gas globes, lustres, windows, etc. Tablets, 6d. each.

Guaranteed perfectly free from mercury and other injurious ingredients frequently used in the manufacture of plate powder.

Oakey's Wellington Knife Polish.

Prepared expressly for the Patent Knife Cleaning Machines, India Rubber and Buff Leather Knife Boards. Knives constantly cleaned with it have a brilliant polish equal to new Cutlery.

Packets, 3d. each; Tins, 6d., 1s., 2s. 6d., and 4s.

Oakey's Wellington Blacklead

Imparts an immediate, brilliant, and lasting polish to all kinds of stoves, iron-work, etc. No waste, dirt, or dust in the use, adheres at once to the stove.

Solid blocks, 1d., 2d. and 4d. each, and 1s. boxes.

Oakey's Polishing Paste,

For cleaning brass, copper, tin, pewter, etc., etc.

Tins, 1d. and 2d.; Pots 6d. and 1s. each.

Oakey's Furniture Cream,

For cleaning and polishing furniture, patent leather, oilcloth, etc.

Glass and Stone Bottles, 6d. and 1s. each.

Oakey's Brunswick & Berlin Black,

For beautifying and preserving stoves and all kinds of iron work.

Bottles, 6d., 1s. and 2s. each.

WHOLESALE :

JOHN Oakey & Sons,

Manufacturers of Emery, Emery Cloth, Blacklead, Cabinet Glass Paper, etc.

WELLINGTON EMERY AND BLACKLEAD MILLS,
WESTMINSTER-BRIDGE ROAD, LONDON, S.E.

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LONDON, CRYSTAL PALACE, 1884.



E. H. THIELLAY'S EAU FONTAINE DE JOUVENCE, GOLDEN; OR, GOLDEN HAIR FLUID,

For rapidly changing Dark Hair into Flaxen or Sunny Shades.

N.B.—This article is now put up in round bottles, instead of flat squares; the glass is extremely strong, hermetically stoppered (Patent), and calculated to resist the strongest possible pressure of the liquid when in hot climates.

There are only three sizes issued at present, namely—

Contents	63 grammes,	125 grammes,	250 grammes.
Price	3/6	8/-	10/6 per bottle.
Wholesale	21/-	36/-	63/- per dozen.

The Contents being respectively $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ of a litre.

Subject to quantitative discount.

ALSO

EAU FONTAINE DE JOUVENCE IN EVERY SHADE.

AUBURN.

DARK.

BROWN.

BLACK.

PROGRESSIVE.

RESTORE.

RESTAURATIVE AND SPECIALE.

WHOLESALE DESCRIPTIVE PRICE LIST ON APPLICATION.

EUCALYPTIA.
MOUSQUETAIRE.
ARABIAN FLUID.

COMPANION.
CREAM OF LILIES.
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EXPORT MANUFACTORY AT NEW CROSS, KENT.
BONDED WAREHOUSE AT RED LION WHARF.

Shippers and Merchants supplied on the usual Terms, and at a
considerable reduction for export in Bond.

May be consulted from 10 to 5, without charge, at his only address,
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Has obtained the highest award at the Calcutta Great International Exhibition, Gold Medal and Diploma of Merit for Dental Improvements Patented and Painless System of Dentistry.

Has obtained the highest award at the Great International Exhibition, New Zealand, Gold Medal and Diploma of Merit for Dental Improvements Patented, also for strength, durability, combined with lightness and for Painless Adaptation of Prize Medal Teeth.

Has obtained the Paris Gold Medal and Diploma of Merit for Dental Improvements Patented and Painless Adjustment of Artificial Teeth.

Has obtained the highest award at the Nice Great International Exhibition for Dental Improvements Patented, and for his Artificial Teeth fixed without springs or wires.

Has obtained the highest award at the International Exhibition, Amsterdam,
for Dental Improvements Patented and Artificial Teeth fitted upon atmospheric
pressure

Will forward his Illustrated 64-page Pamphlet on Painless and Perfect Dentistry, gratis and post free, from his only address,

(Opposite the British Museum,)

BLOOMSBURY, LONDON.

JEWSBURY & BROWN'S ORIGINAL AND CELEBRATED ORIENTAL TOOTH PASTE

Has been used in the highest circles over 60 years for cleansing, beautifying, and preserving the teeth and gums to old age.

Sole Proprietors and Makers, JEWSBURY & BROWN, Manchester.

WHITE & SOUND TEETH INSURED.



The ORIENTAL TOOTH PASTE is composed only of vegetable substances, blended with fragrant compounds. It is distinguished by its extraordinary efficacy in removing tartar, insuring to the teeth the most BEAUTIFUL and PEARLY WHITENESS, and inducing a healthy action of the gums. The ORIENTAL TOOTH PASTE gives PECULIAR FRAGRANCE TO THE BREATH, and will preserve the teeth and gums to OLD AGE. Pots, 1s. 6d., or Double Size, 2s. 6d. KEEPS PERFECT IN ALL CLIMATES.

(OF ALL PERFUMERS AND CHEMISTS.)

CAUTION.—Observe the name and address on the Pots, also the Trade Mark (J. & B. in a double triangle). Without these none are genuine.

WHOLESALE AND RETAIL OF THE SOLE PROPRIETORS AND MAKERS:
JEWSBURY & BROWN, Market Street, Manchester:
and of all Chemists and Wholesale Houses.

BEDDARD'S BELGRAVIA TOOTH-PASTE

(Registered)

Is entirely different from any article of the kind, very much liked by customers, a most effectual dentifrice, and handsomely put up in large jars.

ONE SHILLING EACH. Wholesale of all Patent Houses.

Liberal discount to large buyers.

Prepared only by JOHN BEDDARD,
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DR. C. R. COFFIN'S AMERICAN DENTIFRICE.

Prepared only by WILLIAM DARLING, Chemist, Manchester.

May be had from S. MAW, SON & THOMPSON; BARCLAY & SONS;
F. NEWBERRY & SONS; SANGER & SONS; and any Wholesale House in London.

Price 2s. per box, and family jars, 10s. each

IMPORTANT TO DENTISTS. **The GODIVA MODELLING COMPOSITION.**

The above Preparation, since its introduction in 1870, has acquired a world-wide reputation, and is used by the Principal Dental Practitioners every where.
 For particulars, see the "Special Announcement," interleaved between pages 66 and 67 of the *British Journal of Dental Science*, issued on January 15th, present year. Or write for same to the

MANUFACTURER,
JAMES HINDS, DENTIST, COVENTRY.

To be had of all respectable Dental Depôts throughout the world.

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Retail	1s. 6d.	Wholesale	12s. per doz.
"	2s. 6d.	"	20s. "
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N.B.—To Shippers and others requiring it in Bond, M. E. F. will be happy to forward Special Quotations.

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COPPER, IRON, and TINNED BOTTLING WIRES
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Suited for any substance, from glass and china to leather, wood, or iron, and the articles joined bear washing in boiling water.

The large range of materials to which this cement is applicable, its transparency, strength, and facility in use, and the readiness with which it adheres, renders it without doubt **THE MOST USEFUL EVER INVENTED.** It is equally applicable to articles of the coarsest or the most delicate construction.

The great success which attended its introduction, now more than 20 years ago, has given rise to a host of imitations, under as many various titles, some of these being of an exceedingly crude character, and most unsatisfactory to both vendor and buyer. The above celebrated Cement is uniformly prepared and neatly put up, and is guaranteed to remain unchanged in any climate.

Professor ASCHER, Edinburgh.—"I have invariably found yours superior to all others, and have extensively recommended its use to all my friends."

Sold in Bottles at 6d. and 1s. (equal to 3 of the small).

FOULKES' **TOILET & NURSERY** **POWDER.**

**IMPALPABLE AND
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This unique Powder possesses the emollient properties of fuller's earth, free from colour, and in a high condition of purity.

Sold in Boxes at 1s. and 6d.

Wholesale at the Patent Medicine Houses and Druggists' Sundriesmen, or from
W. J. FOULKES, Pharmaceutical Chemist, Birkenhead.

20s. for a QUARTER-CASK, i.e., 12½ Gallons
(Casks free), of

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BUT WRITE
FOR A
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Tyrer's
"BOROUGH"
Ketchup
SENT FREE
TO ANY ADDRESS
SILVER MEDAL
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"MR. PETER TYRER,

School of Cookery, Crystal Palace, S.E. Jan., 1883.

"Sir,—I have been using the 'Borough' Ketchup, and am very pleased with it. Its flavour is excellent both for all kinds of Savoury Dishes and Soups; and I most certainly should advise every cook and housekeeper to use it, for I HAVE NEVER MET ITS EQUAL.—Yours truly, MARIAN SMITHARD, *Lectress on Cookery.*

CHAS. G. FOOT, Esq., M.D., of Tullow, Co. Waterford, in a letter says: "I shall recommend it to parties in this locality."

Copy of Analysis, June, 1882.

"The sample of Ketchup has been examined, and we are pleased to say that it contains nothing injurious or in any way objectionable to the constitution. Remark,—Very good."—*Anti-Adulteration Company.*

"Your very excellent 'Borough' Ketchup."—*Madam BARBARA W. GOTHARD, Lecturer on Cooking at the Alexandra Palace, N.*

Proprietor of a large Restaurant in Glasgow, writing on August 18th, 1882, says: "It pleases very well."

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A customer at Ramsgate on July 4th, 1882, in writing about the Ketchup used these words: "I must say it is excellent."

A Gentleman at Yalding, after receiving a cask, in September, 1882, writes: "I am very pleased with your 'Borough' Ketchup,—will answer every purpose I want it for."

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"Will no doubt command the favourable attention of connoisseurs."—*The Medical Press.*

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**PRIZE MEDAL,
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GUARANTEED PURE Extract

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"It is strictly pure, and well manufactured in every way."
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SCHWEITZER'S COCOATINA.

ANTI-DYSPEPTIC COCOA OR CHOCOLATE POWDER.

**GUARANTEED PURE SOLUBLE COCOA of the Finest Quality,
without Sugar or any Admixture.**

The FACULTY pronounce it "the most nutritious, perfectly digestible beverage" for BREAKFAST, LUNCHEON, or SUPPER, and invaluable for Invalids and Children.

Cocoatina is the highest class of Soluble Cocoa or Chocolate, with the excess of Fat extracted Mechanically.



Being all Cocoa it is four times the strength of preparations thickened yet weakened with arrowroot, starch, etc., and in reality cheaper than such mixtures.

Made instantaneously with boiling water, a teaspoonful to a breakfast cup, costing less than a halfpenny.

It keeps for years in all climates, and is palatable without milk.

In air-tight tin canisters at 1s. 6d., 8s., 5s. 6d., etc., by Chemists and Grocers.

H. S. & Co.s GUARANTEED PURE FILTERED COCOA BUTTER is the best for all Medical purposes.

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AND ALL WHOLESALE HOUSES.

MARIL'S FINE COGNAC BRANDIES.

* Carte Bleue...	4 years old.
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Has proved a Great Success.

LARGE NUMBERS of CHEMISTS NOW FIND a READY SALE for it.

Those who have not yet tried it are respectfully invited to send for Samples, which will be supplied gratis.

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Beg respectfully to call the attention of the Trade to their

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CONSISTING OF

CONCENTRATED BEEF TEA, MUTTON AND CHICKEN BROTHS, etc.

ESSENCE OF BEEF, MUTTON, VEAL, AND CHICKEN.

BEEF-TEA JELLY AND FIBROUS EXTRACT OF BEEF.

TURTLE SOUP AND JELLY, AND CALF'S FOOT JELLY (prepared expressly for invalids).

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Extract from the *British Medical Journal*, 21st and 28th November, 1874.—The preparations manufactured by Messrs. BRAND & Co., of No. 11, Little Stanhope Street, Mayfair, London, and known as "CONCENTRATED BEEF TEA" and "ESSENCE OF BEEF" respectively, are already largely used by leading medical practitioners in the metropolis. The first is for ordinary use, the second is more especially suited for very delicate stomachs and for invalids. They are prepared with great care from English meat of good quality, and in delicacy of flavour, the fluid extract (Essence of Beef) is well known by London Physicians to be a preparation on which they can entirely rely. Hence the favour which it has met, and our reason for mentioning now with approval the samples submitted to us.

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SHELFANGER.

The Table Water—and lb.—with counteracting proportions of Magnesian and Iron Carbonates. In noticing this water, the *Chemist and Druggist* and *Mineral Water Trade Review*, not only draw the attention of Chemists to it in a pecuniary sense, but add the following opinion, that "The water itself has sufficient intrinsic virtues to support judicious pushing; and is, doubtless, as good as many of the foreign liquids which the English public so confidently imbibe."

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PURE AERATED WATERS,

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PULLNA BITTERWATER, BOHEMIA.

THE OLDEST AND BEST SPRING.

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11, PANTON STREET, HAYMARKET,
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PROSPECTUS.

The Object of the Planters who have formed this Association is to establish a business for the direct supply of Tea from the Plantations of the Kangra Valley to the public.

The distinctive feature of the business is that the Tea is delivered to consumers in the original one pound tinfoil-lined parcels in which it is packed in the Valley, and it is guaranteed to be absolutely pure.

Vide "Medical Times," June 7th, 1894.

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1. KANGRA VALLEY TEA, Orange Pekoe, price 4/- per lb.

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Both these samples are high-class Teas, but although there is no less than 1/- per lb. difference in price, neither analysis or taste differentiates them in the same degree; the higher is a little more astringent and nitrogenous than the lower, but the flavour of the Pekoe was preferred by all the people to whom it was submitted.

3. The third Tea, named PAXON or SOVOKORE, price 2/6, gave when examined in the same way:—Theine, .016 gram; Tannin, .090 gram; Total Extract, .23 gram; Ash, .04. It is thus considerably weaker in all conditions extracted by water, but it is an excellent flavour and is about the best 2/6 Tea the writer has ever examined."

These Teas, retailing respectively at 4/-, 3/-, and 2/6, can be purchased in any quantity, either direct from the Store, 11, Panton Street, or from

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Agents to the Association, from whom Show Cards can be had on application.

Special terms granted to all Chemists and Druggists, to whom the Teas, on account of their absolute purity, are particularly recommended.

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THE PUREST WATER IN ENGLAND,

Soda, Seltzer, Potash, Lemonade, Lithia, and Aërated Waters. Prepared with the celebrated Artesian Well Water, from a great depth, neither cisterned nor exposed to the atmosphere, and FREE FROM ALL CONTAMINATION. Terms, Price, and Agents appointed upon application to E. M. MILLS & CO., Manufacturers, Bourne.

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Is an absolutely pure and sparkling Table Water.

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QUEEN'S PARK, BRIGHTON.

UNDER THE PATRONAGE OF HER MAJESTY.

ESTABLISHED 1825.

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**BRIGHTON SELTZER WATER AND OF PYRO-
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The purest, most delicious and most refreshing of all Tonic Waters, prepared with Distilled Water.

"They have the advantage of certain and invariable composition."—*Lancet*.

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"GENTLEMEN.—Your Pyrophosphate of Iron Water is not only an excellent tonic, but is also a very delicious and refreshing beverage for ordinary use, both for invalids and delicate persons generally. Moreover, in drinking it one feels the comforting confidence that being prepared with DISTILLED WATER one runs no risk of being half poisoned.

"Believe me, yours very truly,

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ESSENCE LEMON "SPECIALTY."

The only pure Essence imported, made at our Works at Sicily.

ESSENCE GINGER ALE,
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TONIC ESSENCE, FOR BITTER WATER.

SOLUBLE ESSENCE LEMON,
SOLUBLE ESSENCE GINGER.

SOLUBLE ESSENCE OF PEPPERMINT.

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BEWARE OF SPURIOUS IMITATIONS.  
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W. J. B. & CO. caution the trade against the so-called Soluble Essences now so frequently offered for sale, which are nothing more than mere tinctures, and although offered at lower prices, cost five or six times as much in use, whilst imparting a strong medicated flavour.

W. J. B. & Co. further beg to inform their friends that aerated drinks, as Pale Ale, Horehound Beer, etc., made from their soluble essences, are exempt from Excise regulations.

NONE OTHERS ARE GENUINE.

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CAUTION!

GUM EXTRACT (French Cream).

PROTECTED BY ROYAL LETTERS PATENT.

*For producing a Permanent Head of Creamy Richness on  
Ginger Beer, Ginger Ale, Lemonade, and other Aerated Bever-  
ages; also on Beers, Ciders, Wines, etc.*

All persons infringing the above patent will be proceeded against, and those who give information of such infringement will be liberally rewarded.

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NATURAL MINERAL WATERS,

DIRECT FROM THE SPRINGS.

ADELHEIDSQUELLE.
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MINERAL SALTS, SOAPS, PASTILES, ETC..

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STRUVE & CO'S ARTIFICIAL MINERAL WATERS.,

PREPARED AT THE ROYAL GERMAN SPA, BRIGHTON,

And Sole London Agents for the celebrated

AËRATED WATERS, PREPARED BY R. ELLIS
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PRICE LISTS, TERMS, AND PAMPHLETS, FREE ON
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WILLIAM BEST & SONS,
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NATURAL MINERAL WATERS OF VICHY.

PROPERTY OF THE FRENCH GOVERNMENT.

CELESTINS.—The water of this spring is very agreeable, sparkling, and slightly acidulated. Remedy for Complaints of the Kidneys, Gravel, Gout, Diabetes, Rheumatism, etc.

HAUTERIVE.—This spring contains a great quantity of carbonic acid, and is especially recommended as a table water.

GRANDE-GRILLE.—For Complaints of the Liver and Biliary Organs, Indigestion, etc.

HOPITAL.—For Stomach Complaints, etc.

VICHY WATERS are pleasant to the taste, and may be drunk pure or mixed with Wines or Spirits.

CAUTION.—See that the name of the particular Water required is on the capsule.

VICHY DIGESTIVE LOZENGES.

MANUFACTURED FROM THE

Salts Extracted from the Mineral Waters of Vichy.

The Vichy Lozenges should be taken by those persons whose digestion is difficult, painful, or laborious. In cases of slow or difficult digestion, a few of the Lozenges should be taken before each repast.

The Lozenges are flavoured with peppermint, lemon, vanilla, rose, orange flowers, or anisette.

VICHY SALTS FOR BATHS.—In Packets sufficient for one Bath.

VICHY BARLEY SUGAR.—An excellent digestive bonbon.

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Y Y

EUGENE GERAUT & CO.,

PATENTERS AND MANUFACTURERS OF

SODA-WATER MACHINES,

Filling Machines, Syphons, Seltzogenes, etc.

SYPHONS

In White, Amber, Blue, or Green Bottles. Made of Pure English Block Tin. Tops warranted free from Lead. Will retain their brilliant polish.

WHOLESALE PRICES.

Short Levers, 23/6 per dozen nett; Cap or Piston Tops.
Long Levers, 24/- per dozen nett; Cap or Piston Tops.
Nickel-plated Top, 3/- per dozen extra.
Strongly Silver-plated Top, from 8/- per dozen upwards.
Customer's Name Stamped on the Metal Tops free for One Gross.
Names and Trade Marks Ornamentally Engraved on the Bottles by the Acid Process, from 1½d. to 2d. each extra. Each Syphon thoroughly tested before being sent out.

SAMPLES SENT ON APPLICATION.

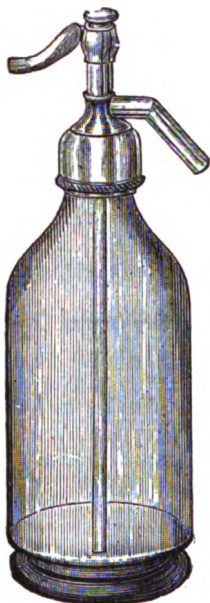
SODA-WATER MACHINERY, GENERATORS, WASHING VESSELS, AND GASOMETERS.

From £40 to £120 (See our Catalogue).

	£	s.	d.
Syphon Filler		4	10 0
Ditto, with Syruping Machine combined	15	15 0	
Bottling and Corking Machine		7	10 0
Ditto, with Syrup Dosing Machine combined	15	15 0	

GUN METAL SYRINGE,

Strongly Silver-plated, for introducing Syrup into Syphons, 15/- each.



EUGENE GERAUT & CO.'S NEW PATENT LEVER SELTZOGENES,

For the immediate production of Eau de Vichy, Soda Water, Sparkling Lemonade and Aërated Waters.

WHOLESALE PRICES AS FOLLOWS:

	s.	d.		s.	d.		s.	d.
Three pint, wire	13	0	Five pint, wire	18	0	Eight pint, wire	30	0
Three pint, cane	13	6	Five pint, cane	19	0	Eight pint, cane	32	0
Three pint strongly silver-plated Tops and richly decorated Porcelain Stands, each 30/-								
Five pint ditto, 38/-; Eight pint ditto, 48/-								

IMPORTANT NOTICE.

For Orders of three we allow 15 per cent. Large discount allowed off quantities upwards.

Strongly silver-plated Top, 5/- each extra.

Powders for the above:

	12 charges.	10 charges.
Three-pint size, in handsome labelled boxes	21s. 0d.	18s. 6d.
Five-pint ditto	30s. 0d.	26s. 0d.
Eight-pint ditto	51s. 0d.	41s. 0d.

LIBERAL DISCOUNT.

Our well-known Seltzogenes are improved yearly, and have already stood a public test of upwards of Twenty Years, and are acknowledged as the **VERY BEST.**

BEST SYRUPS, warranted to be made of the choicest and finest fruits, specially prepared to be used with our celebrated Seltzogenes, are supplied by us.

Illustrated Catalogue on Application.

OUR ONLY ADDRESS IS

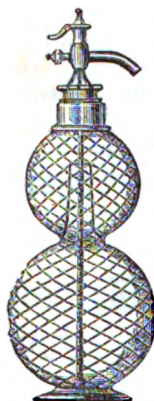
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(lately called 1 and 2, CORPORATION BUILDINGS, FARRINGTON ROAD).

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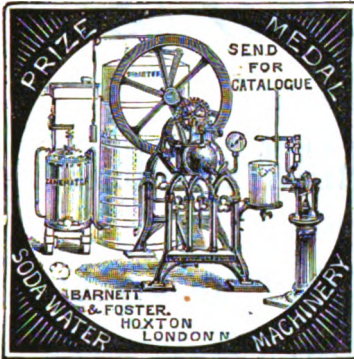
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SODA-WATER MACHINERY AND ALL APPLIANCES

FOR THE MANUFACTURE OF THE HIGHEST CLASS OF



**SODA, POTASS, SELTZER,
CARRARA, LITHIA,
MAGNESIA,
AND TONIC WATERS, ETC.
LEMONADE, GINGER BEER
OR ALE, ORANGEADE,
NECTAR,
CHAMPAGNE CIDER,
FRUIT CHAMPAGNE, ETC.**

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Cape, 1877 ; Paris, 1867, 1878 ;
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Four First Class Certificates and Prize
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No. 1.	to make 700 doz. Bottles per day	...	70	0 0
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No. 6.	" 100 " " " "	...	30	0 0

These are the same for any size Machine.

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The above quantities are for Lemonade and other Saccharine Drinks ; if for Splits, reckon double ; if for a very highly charged Soda Water, reckon half.

Our Machines are universally adopted throughout the world for the manufacture of all kinds of Aerated Drinks, whether in bottles, syphons, or counter fountains. There are in England alone over 2,000 factories where our Machinery is in use. They are the simplest, safest, and cheapest for the purpose, and produce a highly charged gaseous water free from metallic or foreign contamination.

These Machines are all packed without taking apart, and can be set to work immediately on arrival. Many of our Machines have been in constant use for forty years without requiring any repairs. Recipes and every information given for manufacturing all the above Drinks, so that the most inexperienced can at once produce Waters of the highest class.

Inventors of Fruit Champagne. Sample Case, containing 1 dozen, forwarded for 6s. 6d.

THE "LONDON-MADE" SYPHON BOTTLE.

PRICES.—Quart size, 22s. per doz. ; Pint size, 21s. per doz., by the gross.

No charge for packing if ordered in Bin Cases, 2s. 6d. each, holding 1 dozen.



The high reputation this bottle has achieved is due to the fact of its being in every particular the most perfect yet introduced, and when compared with others in the market it stands pre-eminent. It is the most simple in its working parts, therefore the least liable to get out of order ; it is the most easily opened, the lightest pressure on the handle being sufficient ; it produces a more highly charged gaseous water than is usually obtained from syphons ; it compares most favourably in appearance with any, and the metal top being entirely free from lead, the prejudice against syphon drinks is at once removed, as the liquid passes over pure tin only.

Illustrated Catalogue forwarded Free.

Sole Agents for Codd's Patent Bottles—the best for Aerated Waters.

BARNETT & FOSTER,

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HAS RECEIVED AT THE
INTERNATIONAL HEALTH EXHIBITION,
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THE HIGHEST AWARD
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"The Richest Natural Aperient Water."

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"Most pleasant to the palate."

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British Medical Journal, 30th Aug., 1884.

"For about ten years I have prescribed Hunyadi János Water wherever a purgative is required of prompt, safe, and measured action."

Jacob Moleschott, Professor of Physiology, Rome, 19th May, 1884.

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THE APOLLINARIS COMPANY, LIMITED,
 On the Label Secures Genuineness.

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